



Can industry information disclosure improve audit quality?



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ABSTRACT

We investigate the impact of industry information disclosure (IID) on audit quality in Chinese listed companies from 2010 to 2021, by constructing a staggered difference-in-differences model based on the implementation of the IID guidelines in the Shanghai and Shenzhen stock exchanges in 2013 as an exogenous shock. Audit quality is significantly improved after the implementation of the IID guidelines. We also use a parallel trend test, different measurements of key variables, propensity score matching, a placebo test and different samples, to ensure the validity of our findings. IID enhances audit quality by improving auditor independence, professionalism and audit engagement, particularly in firms with high-quality and numerous IIDs, high auditor rankings, strong auditor industry expertise, IIDs with a negative tone and low R&D investment. We demonstrate the effectiveness of the IID guidelines from the perspective of auditing.

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1. Introduction

Information disclosure regulation is one of the most important policies in the capital market. It can effectively mitigate the resource mismatch and market failure caused by information asymmetry and increase the effective information content of the capital market. Industry information disclosed by listed companies allows investors to directly understand the production and operating status of the industry, thereby reducing the information asymmetry between listed companies and their stakeholders. It also provides more accurate infor-

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mation enabling small and medium shareholders to make investment decisions and auditors to issue audit opinions.

In January 2013, the Shenzhen Stock Exchange (SZSE) issued industry information disclosure (IID) guidelines for two pilot industries, and the Shanghai Stock Exchange (SSE) introduced guidelines for seven industries, including real estate, in October 2015. To date, the SSE and SZSE have issued 43 IID guidelines, covering 14 primary industries and 58 secondary industries,¹ aiming at addressing the problems of incomplete and incomprehensive IID. In the past, the territorial supervision mode meant that IID was not highly targeted or industry-specific. The information disclosure supervision of listed companies was unified according to the region where the company was located, and the supervisors of each listed company were required to collectively perform information supervision duties in their respective jurisdictions. However, in the context of the transformation of capital market information regulation, IID supervision has gradually shifted from territorial regulation to industry regulation, reflecting the idea of “transforming government functions and innovating regulatory methods (Shi et al., 2020, p383),” as proposed in the report of the 19th National Congress.

The implementation and enforcement of the IID guidelines raise questions about their impact on the audit quality of listed companies. Studies identify several internal and external factors affecting audit quality, such as auditor organization characteristics (DeAngelo, 1981; Bowlin et al., 2015), auditor characteristics (Chan et al., 2002; Minutti-Meza, 2013), the internal characteristics of audited enterprises (Bills et al., 2016; Bills et al., 2018) and external regulatory institutions (Boone et al., 2007; Krishnan et al., 2017). However, few studies examine the impact of the guidelines on audit quality. On the one hand, the implementation of the guidelines requires enterprises to disclose operational information, such as their operating revenues, operating costs, gross profits and research and development (R&D). This disclosure reduces uncertainty and increases transparency among peer firms, providing auditors with more useful audit information and improving audit quality. On the other hand, the value attributes and price discovery functions of corporate information (Hendershott et al., 2020) may induce companies to strategically re-disclose previously disclosed information to meet the mandatory disclosure requirements of the guidelines, instead of providing their core financial and non-financial information. The strategic re-disclosure of industry information can result in information redundancy and reduce audit quality. Therefore, the aim of this study is to investigate whether and how IID affects the audit quality of listed companies.

To address this issue, we use a staggered difference-in-differences (DID) model to test the impact of IID on audit quality based on the guidelines issued for Shanghai and Shenzhen A-share listed companies from 2010 to 2021 as a policy shock. Our results show that IID can improve audit quality by enhancing audit independence, audit professionalism and audit effort. Moreover, the impact of IID on audit quality is particularly pronounced in firms with high-quality disclosures, high-ranking auditors, prominent auditor industry expertise, a negative tone and low R&D investment.

The study makes several contributions to the literature. First, it confirms the positive effect of the IID guidelines on the audit quality of listed companies, providing empirical support for their policy effectiveness. This expands research on the economic consequences of IID and enhances our understanding of the benefits of information transparency in the capital market. Second, this study enriches the literature on the factors that influence audit quality by exploring the impact of IID. We find that IID enhances audit quality by improving auditor independence, auditor professionalism and audit effort. Finally, our study explores the differences in the impact of IID on audit quality across various disclosure quantities and quality levels, auditor sizes, types of auditor industry expertise, tone characteristics and industry characteristics. This provides strong evidence for the continuous improvement of IID and its regulation, contributing to the construction of an information-transparent capital market.

The rest of the article is organized as follows. In Section 2, we provide a literature review and discuss the research hypotheses. In Section 3, we introduce the research design. The main empirical results are presented in Section 4. In Section 5, further analysis is provided, and we present the conclusions in Section 6.

¹ Official website of the SSE: <https://www.sse.com.cn/disclosure/announcement/general/>. Official website of the SZSE: <https://www.szse.cn/disclosure/notice/general/>.

2. Institutional background, literature review and research hypotheses

2.1. Institutional background

Prior to the issuance of the IID guidelines, information disclosure supervision for A-share listed companies in Shanghai and Shenzhen was based on territorial supervision regulations, which had been in place for more than 20 years. While this approach achieved some success, it had several drawbacks. First, the uniform system of information regulation was too rigid, given the wide variation in characteristics among enterprises in the same region. Second, the regulation system was fragmented and one-sided, making it difficult to implement information regulation effectively. Finally, to meet the regulatory requirements, listed companies did not carry out sufficient “effective disclosure,” resulting in issues such as patchwork disclosure, selective disclosure and even plagiarism, which hindered the governance of information disclosure and its regulation.²

To address these challenges, the SSE and SZSE began to reform the regulation of the information disclosure of listed companies. The SZSE piloted the guidelines for two industries, namely (1) radio, film and television and (2) pharmaceuticals and biological products, beginning on 7 January 2013. This was followed by the release of additional guidelines between 2015 and 2021, covering 24 industries, including the photovoltaics industry; the energy-saving and environmental protection services industry; and internet gaming, video and e-commerce. In 2015, the SSE also issued guidelines for 27 industries, including real estate, coal, electricity, retail, automobile manufacturing and pharmaceutical manufacturing. The guidelines issued by the SSE and SZSE covered almost all industry categories; however, for each industry category, the most common sub-sectors were selected for the pilot implementation of the guidelines. The sub-sectors selected for pilot implementation had distinct characteristics in the process of IID.

The SSE and SZSE guidelines require listed companies to disclose key operational information in their annual reports, taking into account macro factors, the market environment, operational characteristics and industry status. The SSE guidelines require listed companies to compare their operational information horizontally with that of peer firms in the same industry. The SZSE guidelines require listed companies to disclose business information that accounts for more than 30% of their revenue or net profit in the last fiscal year, as well as the key technical indicators of products that account for more than 10% of their operating revenue during the reporting period.

To illustrate the development of sub-industry information regulation, this study uses the automobile manufacturing industry as an example. SSE Announcement [2015] No. 21, issued on 6 July 2015, introduced Guidelines No. 6 for the automobile manufacturing industry. The guidelines cover the overall operation of the automobile manufacturing industry (i.e., sales volume of the sub-sector, sales growth), industry development (i.e., market access, fuel standards, emission requirements, new energy, import, export and consumption of various inputs in the sub-sector) and industry competition (i.e., major competitors in the segment, market shares and related changes). On 11 September 2015, the SSE officially issued IID Guidelines No. 1 to No. 7, including Guidelines No. 6 for the automobile manufacturing industry. Compared with the previous version, the newly issued Guidelines added some specific quantitative ranges for peer-to-peer information disclosure in the automobile manufacturing industry. They also added requirements for the summarization and separate disclosure of component supplier information. On 11 January 2021, the SSE revised the guidelines for listed companies in the automobile manufacturing industry. The revision primarily amended the relevant expressions to add disclosure specifications for new business models. Meanwhile, the SZSE issued guidelines for the automobile manufacturing industry on 6 January 2021, with a similar focus on disclosure requirements. Thus, this study considers the year of the initial introduction of the guidelines for an industry in Shanghai or Shenzhen as the starting point of the exogenous shock. For the automotive manufacturing industry, this is 2015 for the SSE and 2021 for the SZSE. Similar approaches are taken for other industries in the SSE and SZSE.

² For the SSE's Q&A on the regulation of information disclosure by listed companies by industry, see https://sse.com.cn/aboutus/mediacenter/hotandd/c_c_20150912_3988813.shtml.

Over the last 10 years, information disclosure guidelines have proven effective in the SSE and SZSE. They require the comprehensive disclosure of corporate operating, investment and financing information through regular and interim reports, as well as industry and company characteristics. The guidelines consider the costs and benefits of information disclosure, the principles of open-door regulation and its continuous revision and improvement and the specific business model of the company. The disclosure of information has been modified based on industry characteristics, reducing the information asymmetry between listed companies and shareholders and providing accurate information for decision-making. However, the implementation of the guidelines by companies remains poor and requires further improvement (Chen and Li, 2018). Despite these challenges, the guidelines increase the supply of industry-related information in the capital market, providing a quasi-natural experimental environment to study the impact of IID on audit quality. The guidelines are exogenous and do not change the operating rules or regulatory environment of the capital market. This makes them a valuable tool through which to examine the relationship between IID and audit quality.

2.2. Literature review

Scholars conduct extensive research on the factors influencing audit quality and focus on the following four areas: audit firms, auditors, audited firms and the relevant institutional environment.

Membership in professional organizations can provide benefits for small and medium-sized audit firms, such as training and collaboration and helping small audit firms to access large audit clients and increase their audit fees and audit quality (Bills et al., 2016; Lisic et al., 2019). Field studies (Bills et al., 2018) also find that the membership credentials of smaller accounting firms permit access to greater expertise and public recognition. However, the impact of accounting regulation on audit quality remains inconsistent (Boone et al., 2015; Lamoreaux, 2016). For example, when an accounting firm is subject to stringent sanctions by the U.S. Securities and Exchange Commission (SEC), the reputation of the accounting firm suffers, directly leading to a reduction in audit clients and audit fees (Chan and Wu, 2011; Boone et al., 2015). Other factors, such as consulting revenue (Lisic et al., 2019), political affiliations (Knechel and Park, 2022) and artificial intelligence use (Fedyk et al., 2022) in accounting firms, can also significantly improve audit quality.

Individual differences in auditors, such as industry expertise, can significantly improve audit quality (Reichelt and Wang, 2010). However, prior to the financial crisis, over-specialization may have weakened the positive relationship between industry specialization and audit quality in the banking sector (Cassell et al., 2019). The auditor's tenure, auditor changes and the auditor's professional qualities also affect audit quality (Bowlin et al., 2015; Bratten et al., 2019; Patterson et al., 2019).

A firm's information disclosure can affect its audit quality, with more complete and high-quality information ultimately improving audit quality (Copley, 1991; Zhang, 2018). Other factors, such as equity concentration (Gul et al., 2010), textual similarity of financial information (Brown and Knechel, 2016) and disclosure tone (Campbell et al., 2020), can also affect audit quality (Kitiwong and Sarapaivanich, 2020).

The institutional environments of enterprises can also affect audit quality. For example, inspection by the U.S. Public Company Accounting Oversight Board (PCAOB) can reduce abnormal accruals and enhance the value relevance of accounting information, thus improving audit quality (Lamoreaux, 2016; Krishnan et al., 2017).

However, studies do not examine the impact of IID, a factor at the institutional environment level, on audit quality from the perspective of changes in the external institutional environment. This study adopts a staggered DID method to examine audit quality from the perspective of IID, enriching the literature on the factors affecting audit quality. It also expands research on the economic consequences of IID, providing incremental evidence for the effectiveness of industry disclosure from an audit perspective.

2.3. Theoretical analysis and research hypotheses

Audit quality is the probability of an auditor detecting and reporting material misstatements and omissions in financial reporting (DeAngelo, 1981). According to the literature review above, IID affects audit quality via three main factors: auditor independence, auditor professionalism and audit effort.

In terms of auditor independence, the IID guidelines eliminate territorial regulation, creating geographical separation between the audited entities and auditors and reducing audit opinion shopping by the audited entities. Before the IID guidelines were implemented, territorial regulation required the same regulator to supervise the information disclosure of different industries, which made it difficult to cover all aspects of information disclosure and regulation due to limited attention and expertise, providing opportunities for managers to misbehave. Sub-industry regulation also reduces opportunities for close contact between information regulators and enterprise personnel, increasing the independence of auditing bodies and auditors. This reduces opportunities for management opportunism, improves corporate transparency (Johl et al., 2021) and ultimately enhances audit quality.

In terms of auditor professionalism, the guidelines increase the quantity and quality of industry-related information through changes in the disclosure and regulatory model. This increases the amount of IID, reduces information asymmetry and deepens the auditor's understanding of the audited company. The disclosure of enterprises' operating information also enhances the comparison of relevant information among enterprises in the same industry, which can further reduce the degree of information asymmetry (Johnstone, 2021). The comparison of companies in the same industry reduces information asymmetry, increases the probability of detecting bad news and improves audit quality. Additionally, the comparison of industry information reduces the difficulty and costs of searching information, reducing the auditor's workload and further improving audit quality.

In terms of audit effort, the guidelines require auditors to pay sufficient attention to and increase audit inputs to avoid audit risk, thereby improving audit quality. The promulgation and implementation of the guidelines are innovative, mandatory, universal and legitimate, incentivizing auditors and listed companies to pay attention to them. Auditors increase their audit pricing and audit hours, and enterprises increase their spending on audit fees. Investment in audit fees and audit hours is ultimately manifested as an improvement in audit quality (Dye, 1993). The cross-regional regulatory enforcement of IID increases compliance with information disclosure, reducing audit risk and legal liability and ultimately improving audit quality.

Overall, the guidelines increase the professionalism and independence of auditors and increase the audit input to avoid audit risk. This, in turn, enhances the transparency of corporate information and reduces information asymmetry, and it improves the effectiveness of information for decision-making, which leads to higher audit quality.

Based on the literature review, the following research hypothesis is proposed:

H1. *Ceteris paribus*, IID can improve audit quality.

However, selective and strategic IID can potentially hinder the auditor's work and reduce audit quality. According to noise theory, invalid information in disclosures can detract the attention of the trustee and hinder access to effective information. Management may also use invalid disclosures in financial reports to mislead the public (Blanco et al., 2021). Additionally, studies find that in implementing the IID guidelines, almost half of enterprises do not strictly follow the regulations, particularly with regard to confidential corporate information such as critical business data and unique risk information, making IID less effective (Chen and Li, 2018). Corporate competition theory suggests that firms are hesitant to disclose information with value attributes and price discovery functions (Hendershott et al., 2020). Disclosing valuable core information can provide competitors in the same industry with opportunities to catch up, and firms that proactively disclose key industry information are at a competitive disadvantage. To comply with the mandatory disclosure requirements of the guidelines, enterprises may disclose industry-related information either selectively or strategically (Chen et al., 2021). This meets the mandatory requirement of compliant disclosure while avoiding the leakage of critical information about the enterprise's operations. Both selective and strategic disclosure can increase noise in financial reporting, leading to greater information asymmetry between management and auditors. Management may use financial reporting redundancy to hide "bad news" for their own benefit, resulting in increased audit risk and difficulties for auditors (Schrand and Walther, 2000). As more invalid information is disclosed about the industry, the level of redundancy in financial reporting increases, increasing the auditor's cognitive load and lowering audit quality.

The hypothesis development framework for this study is shown in Fig. 1, and the second research hypothesis is as follows:

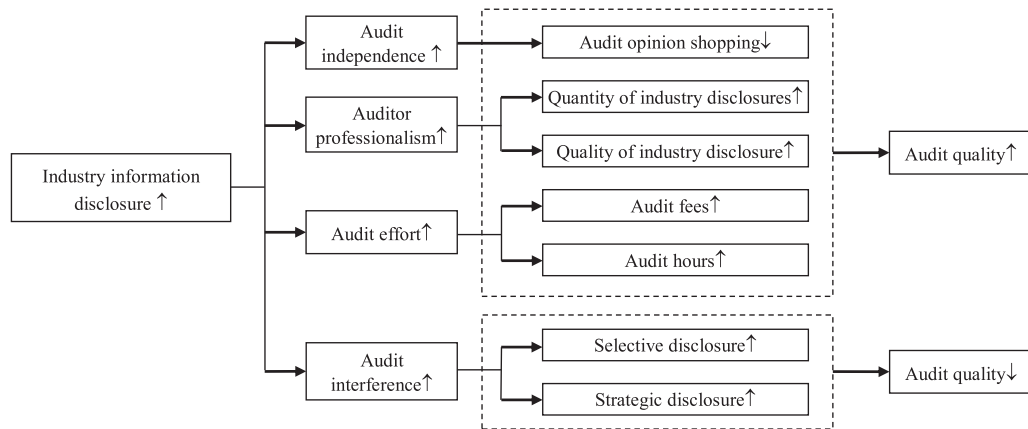


Fig. 1. The hypothesis development framework. Note: “↑” indicates an increase; “↓” indicates a decrease.

H2. Ceteris paribus, IID can reduce audit quality.

3. Data and research design

3.1. Data sources and sample selection

The IID guidelines were initially introduced and implemented by the SZSE on 7 January 2013, and the SSE and SZSE later launched industry pilots of the guidelines in 2015, which continued until January 2021. To investigate the impacts of these guidelines, this study selects all Chinese A-share listed companies in the SSE and SZSE operating from 2010 to 2021 as a research sample. After excluding listed companies in the financial sector, those with Special Treatment (ST) and Particular Transfer (PT) status and those with missing financial data, we obtain a final sample of 20,413 observations. The study uses data from the China Stock Market & Accounting Research Database (CSMAR) and Chinese Research Data Service (CNRDS) databases, and all continuous variables are winsorized at 1% and 99% to mitigate the influence of extreme values.

3.2. Models and variables

This study employs a staggered DID model to investigate the impact of the IID guidelines gradually introduced and implemented by the SZSE and SSE on audit quality. To ensure the reliability of the research findings, two distinct models, ordinary least squares (OLS) and logit models, are used concurrently to conduct the study.

$$Opinion_{i,t}/AQ_{i,t} = \alpha_0 + \alpha_1 Post_{i,t} + \alpha_2 Controls_{i,t} + \alpha_3 \sum Firm_{i,t} + \alpha_4 \sum Year_{i,t} + \varepsilon_{i,t} \quad (1)$$

The explanatory variable $Opinion_{i,t}/AQ_{i,t}$ represents a firm’s audit quality and measures whether the firm receives a non-standard audit opinion ($Opinion_{i,t}$) in the current year (Chen et al., 2011; Tong et al., 2022). The value of $Opinion_{i,t}$ is 1 if the firm receives a non-standard audit opinion in the current year and 0 otherwise. The measurement of a firm’s audit quality $AQ_{i,t}$ is based on Luo et al. (2018), considering the audit opinion of the firm, and it is defined as shown in Table 1. The explanatory variable $Post_{i,t}$ is used to measure the

Table 1
Variable definitions.

Type	Variable	Symbol	Definition
Explained variable	Audit quality	<i>Opinion</i>	The audit opinion of company <i>i</i> in year <i>t</i> is 1 if it is not a standard audit opinion; otherwise, the value is 0.
		<i>AQ</i>	The audit opinion of company <i>i</i> in year <i>t</i> is coded as follows: 1 for a standard unqualified opinion, 2 for an unqualified opinion with a matter paragraph/explanation, 3 for a qualified opinion, 4 for a qualified opinion with a matter paragraph/explanation, 5 for an adverse opinion and 6 for an unavailable opinion.
Explanatory variable	IID dummy variable	<i>Post</i>	The value is 1 for the year in which the industry guidelines are first introduced and in all subsequent years; otherwise, the value is 0.
Control variables	Size	<i>Size</i>	The natural log of total assets.
	Return on assets	<i>Roa</i>	The ratio of net income to total assets.
	Leverage	<i>Lev</i>	The ratio of total liabilities to total assets.
	Current ratio	<i>Current</i>	The ratio of current assets to current liabilities.
	Sale growth	<i>Growth</i>	Sales change.
	Cash ratio	<i>Cash</i>	(Cash and cash equivalent + financial assets held for trading)/total assets.
	Inventory as a percentage	<i>Inv</i>	The ratio of inventory to total assets.
	Accounts receivable as a percentage	<i>Rec</i>	The ratio of accounts receivable to total assets.
	Loss	<i>Loss</i>	The value is 1 if the net profit of the previous year is negative; otherwise, the value is 0.
	Board size	<i>Board</i>	The number of board members.
	Size of the audit firm	<i>Big10</i>	Whether the audit firm is ranked as one of the “Top 10” audit firms in China; if yes, the value is 1 and the value is 0 otherwise.
	Percentage of independent directors	<i>Idr</i>	The number of independent directors as a percentage of the total number of board members.
	Shareholding ratio of institutional investors	<i>Insinvestor</i>	The shareholding of institutional investors as a percentage of total share capital.
	Percentage of shareholding of the largest shareholder	<i>Top1</i>	The number of shares held by the largest shareholder as a percentage of total share capital.
	CEO–chairman duality	<i>Dual</i>	The value is 1 for enterprises for which the chairman and CEO are the same person; otherwise, the value is 0.
Audit tenure	<i>Autenure</i>	The length in years of the auditor’s tenure at the focal enterprise.	
Auditor changes	<i>Auchange</i>	If the auditor changes from the previous year, the value is 1; otherwise, the value is 0.	
Nature of ownership	<i>Soe</i>	A dummy variable equal to 1 for state-owned enterprises and 0 for others.	

level of information disclosure in the industry to which the firm belongs, based on the policy shock of the guidelines issued and implemented by the SSE and SZSE during the 2013–2021 period. The value of $Post_{i,t}$ is 1 in the year the guidelines are first introduced and in subsequent years and 0 in other years.³

This study controls for various factors based on the literature (Chen et al., 2011; Minutti-Meza, 2013; Tong et al., 2022). Financial-level indicators, such as firm size (*Size*), return on assets (*Roa*), asset–liability ratio (*Lev*), current ratio (*Current*), main revenue growth rate (*Growth*), cash ratio (*Cash*), inventory ratio (*Inv*), accounts receivable ratio (*Rec*) and loss (*Loss*), are included in the analysis. Corporate governance-level indicators, such as board size (*Board*), Chinese big10 audit firms (*Big10*), proportion of independent directors (*Idr*), shareholding of institutional investors (*Insinvestor*), shareholding of the largest shareholder (*Top1*) and dual role of the CEO and chairman (*Dual*), are also considered. Furthermore, audit-level indicators, such as audit tenure (*Autenure*) and auditor changes (*Auchange*), are controlled for. The nature of firm ownership

³ The SSE and SZSE require the disclosure of industry-related information about the enterprise in annual and semi-annual reports (the SSE also requires monthly reports). Risk factors that have a significant adverse impact on the company’s future development strategy and the achievement of its business objectives should be disclosed more regularly and in a timely manner, and the economic consequences of IID are revealed in the same year. Thus, $Post_{i,t}$ has a value of 1 for the year the guidelines for the industry to which the enterprise belongs are first issued and in all subsequent years.

Table 2
Descriptive statistics and variance inflation factor (VIF) results for key variables.

Variable	N	Mean	SD	Min	P25	Median	P75	Max	VIF	1/VIF
Opinion	20,413	0.025	0.155	0.000	0.000	0.000	0.000	1.000		
AQ	20,413	1.039	0.290	1.000	1.000	1.000	1.000	6.000		
Post	20,413	0.131	0.338	0.000	0.000	0.000	0.000	1.000	1.070	0.935
Size	20,413	22.140	1.312	19.570	21.190	21.930	22.870	25.990	1.917	0.522
Roa	20,413	0.042	0.058	-0.279	0.016	0.040	0.070	0.197	1.349	0.741
Lev	20,413	0.419	0.211	0.053	0.246	0.410	0.581	0.899	2.863	0.349
Current	20,413	2.697	2.880	0.300	1.162	1.723	2.948	16.350	2.307	0.433
Growth	20,413	0.398	1.077	-0.771	-0.031	0.131	0.414	7.423	1.084	0.923
Cash	20,413	0.221	0.158	0.016	0.105	0.174	0.296	0.741	1.761	0.568
Inv	20,413	0.149	0.138	0.000	0.061	0.115	0.187	0.705	1.310	0.764
Rec	20,413	0.113	0.099	0.000	0.032	0.090	0.166	0.472	1.124	0.889
Loss	20,413	0.077	0.267	0.000	0.000	0.000	0.000	1.000	1.070	0.934
Board	20,413	8.626	1.705	5.000	7.000	9.000	9.000	15.000	1.517	0.659
Big10	20,413	0.514	0.500	0.000	0.000	1.000	1.000	1.000	1.029	0.972
Idr	20,413	0.374	0.054	0.182	0.333	0.333	0.429	0.571	1.347	0.742
Insinvestor	20,413	44.800	24.55	0.097	25.390	46.710	64.400	91.910	1.749	0.572
Top1	20,413	35.030	15.11	8.990	23.140	33.000	45.170	75.100	1.414	0.707
Dual	20,413	0.272	0.445	0.000	0.000	0.000	1.000	1.000	1.133	0.882
Auchange	20,413	0.618	0.486	0.000	0.000	1.000	1.000	1.000	1.003	0.997
Autenure	20,413	7.126	5.307	1.000	3.000	6.000	10.000	23.000	1.067	0.938
Soe	20,413	0.360	0.480	0.000	0.000	0.000	1.000	1.000	1.408	0.710
Mean VIF									1.448	

(Soe) is also included. To address endogeneity issues arising from omitted variables at the firm and industry levels and to account for the impact of macroeconomic changes over time, firm–year and industry–year fixed effects are controlled for. The specific variables used in the analysis are defined in Table 1.

4. Empirical results

4.1. Descriptive statistics

Table 2 presents the descriptive statistics for the main variables. The mean values of audit quality are 0.025 and 1.039, which is consistent with the findings of other studies (Chen et al., 2011; Tong et al., 2022). Each release of the guidelines ($Post_{i,t}$) is specific to a different industry. However, only 2,678 out of 20,413 observations in all 78 sub-sectors are subject to the guidelines, accounting for only 15.10% of the total, despite 18 of the 21 industries being subject to the guidelines during the sample period. Therefore, the mean value of $Post_{i,t}$, which is 0.131, suggests that the guidelines are implemented in a stratified sampling manner, with only a small number of firms subject to the guidelines. However, the industries to which the firms belong cover most of the industries.

The descriptive statistics of the remaining variables fall within the normal range. To address multicollinearity among the variables, the variance inflation factor (VIF) is calculated for all variables, with a maximum VIF value of 2.863, a minimum value of 1.003 and a mean value of 1.448. The VIF values are well below the threshold of 10, indicating that there is no significant multicollinearity among the variables.

Table 3
Industry information disclosure (IID) and audit quality.

	<i>Opinion</i> (1)	<i>Opinion</i> (2)	<i>Opinion</i> (3)	<i>AQ</i> (4)	<i>AQ</i> (5)	<i>AQ</i> (6)
<i>Post</i>	0.7119*** (3.375)	0.7838*** (3.502)	0.0140*** (3.182)	0.0170** (2.486)	0.0190*** (2.864)	0.0173** (1.974)
<i>Size</i>		-0.4910*** (-5.808)	-0.0139*** (-4.722)		-0.0159*** (-7.156)	-0.0144** (-2.458)
<i>Roa</i>		-11.2497*** (-12.739)	-0.5055*** (-20.837)		-1.0083*** (-25.541)	-1.1135*** (-22.972)
<i>Lev</i>		4.6023*** (8.971)	0.1138*** (8.473)		0.1326*** (8.130)	0.1353*** (5.040)
<i>Current</i>		0.0430 (0.966)	0.0014* (1.792)		0.0028*** (2.701)	0.0024 (1.570)
<i>Growth</i>		-0.0553 (-0.942)	-0.0044*** (-3.771)		-0.0002 (-0.125)	-0.0078*** (-3.296)
<i>Cash</i>		-1.4823** (-2.257)	-0.0276** (-2.140)		-0.0374** (-2.132)	-0.1034*** (-4.010)
<i>Inv</i>		-3.8059*** (-5.407)	-0.1278*** (-6.817)		-0.1423*** (-7.069)	-0.2908*** (-7.765)
<i>Rec</i>		-0.7780 (-0.906)	0.0522** (2.024)		-0.0341 (-1.452)	0.1258** (2.444)
<i>Loss</i>		0.9860*** (6.315)	0.0309*** (7.793)		0.0618*** (8.141)	0.0474*** (5.979)
<i>Board</i>		0.0686 (1.266)	0.0022 (1.595)		0.0027* (1.923)	0.0070*** (2.596)
<i>Big10</i>		0.0116 (0.078)	0.0008 (0.246)		-0.0056 (-1.317)	-0.0034 (-0.539)
<i>Idr</i>		1.9453 (1.278)	0.0262 (0.770)		0.0789* (1.870)	0.0834 (1.229)
<i>Insinvestor</i>		0.0037 (0.835)	0.0001 (0.452)		0.0003*** (3.290)	0.0001 (0.550)
<i>Top1</i>		-0.0239*** (-3.596)	-0.0005** (-2.425)		-0.0007*** (-4.362)	-0.0010** (-2.500)
<i>Dual</i>		-0.0954 (-0.568)	-0.0036 (-0.975)		-0.0041 (-0.869)	-0.0127* (-1.718)
<i>Auchange</i>		0.2135 (1.625)	0.0026 (1.251)		0.0092** (2.289)	0.0069* (1.676)
<i>Autemure</i>		-0.0274* (-1.909)	-0.0001 (-0.411)		-0.0015*** (-3.885)	-0.0013* (-1.917)
<i>Soe</i>		-0.6133*** (-3.012)	-0.0018 (-0.223)		-0.0404*** (-8.185)	-0.0162 (-0.996)
<i>Constant</i>	-5.4651*** (-7.771)	3.9492** (2.079)	0.3041*** (4.658)	1.0365*** (468.835)	1.3736*** (28.677)	1.3418*** (10.286)
<i>Firm FE</i>	No	No	Yes	No	No	Yes
<i>Industry FE</i>	Yes	Yes	No	Yes	Yes	No
<i>Year FE</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	20,382	20,382	19,798	20,413	20,413	19,798
<i>Pseudo R²/Adj_R²</i>	0.0052	0.0895	0.3190	0.0067	0.0772	0.2255

Notes: Standard errors are corrected for heteroskedasticity and clustering at the firm level (t-statistics are given in parentheses). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

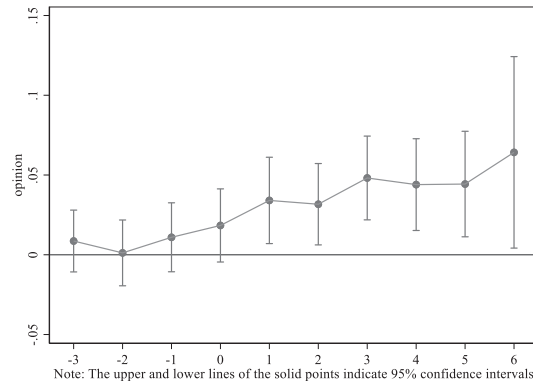


Fig. 2. Parallel trend test: Audit quality (*Opinion*).

4.2. Regression analysis

Table 3 lists the regression results for the impact of IID on audit quality. Columns (1) and (2), and columns (4) and (5), respectively, present the regression results with and without the control variables, controlling for industry-year fixed effects. Columns (1) and (2) present the regression results of the logit model, and columns (3)–(6) present the regression results of the OLS model.⁴ The regression results for both measures of audit quality show that IID ($Post_{i,t}$) has a significant positive effect on audit quality ($Opinion_{i,t}$ and $AQ_{i,t}$). The estimation method of the average marginal effect indicates that the implementation of the guidelines by firms increases the probability of a non-standard audit opinion from the auditor by 18.928%, and the six-dimensional audit opinion ($AQ_{i,t}$) increases by 0.098% toward an unavailable opinion. These results indicate that IID can significantly improve the audit quality of firms, supporting H1.

In terms of control variables, *Size*, *Roa*, *Cash*, *Inv* and *Top1* are significantly negatively related to audit quality. Moreover, *Lev* and *Loss* are significantly positively related to audit quality, which is generally consistent with the findings of previous studies (Reichelt and Wang, 2010; Minutti-Meza, 2013; Johl et al., 2021).

4.3. Robustness tests

4.3.1. Parallel trend test

The parallel trend assumption is a key aspect of the DID approach. To verify that the parallel trend assumption is satisfied, the study constructs Model (2), based on previous research (Beck et al., 2010), to conduct a staggered DID parallel trend test for the different periods in which the policy is implemented. This test helps to determine whether the trends in audit quality changes between the treatment and control groups are consistent for the years prior to the year of the audit.

$$Opinion_{i,t}/AQ_{i,t} = \beta_0 + \beta_1 \sum_{t=1}^{t=3} Treat_i * Before_{i,t} + Treat_i * Current_{i,0} + \beta_1 \sum_{t=1}^{t=6} Treat_i * After_{i,t} + \beta_2 Controls_{i,t} + \beta_3 \sum Firm_{i,t} + \beta_4 \sum Year_{i,t} + \epsilon_{i,t} \quad (2)$$

In Model (2), $Before_{i,3}$ to $Before_{i,1}$, $Current_{i,0}$ and $After_1$ to $After_6$ are, respectively, interacted with the cross-multiplication term $Treat_i$. They are defined as 3 years before, the year of and 6 years after the implementation of the guidelines, respectively. The results of the parallel trend test for the two measures of audit

⁴ Column (3) of Table 3 provides the results of the OLS model to control for firm-year fixed effects if the loss of sample observations is severe when controlling for firm-year fixed effects using the logit model. The results are also largely consistent when controlling for firm-year fixed effects using the logit model.

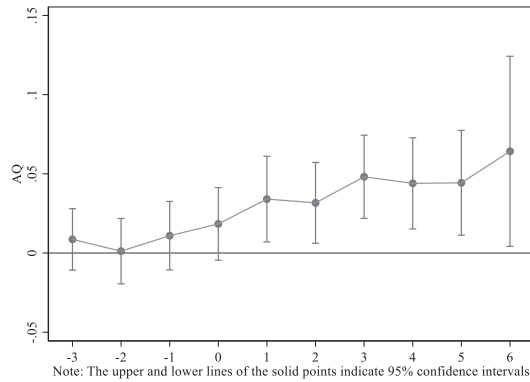
Fig. 3. Parallel trend test: Audit quality (AQ).

Table 4
Robustness testing: Alternative measures of the main variables.

	<i>Restatement</i>	<i>Restatement</i>	<i>Restatement</i>
	(1)	(2)	(3)
<i>Post</i>	-0.3305*** (-2.935)	-0.3282*** (-2.914)	-0.0276** (-2.371)
<i>constant</i>	-2.4475*** (-8.377)	-1.4705* (-1.831)	-0.0874 (-0.494)
<i>Controls</i>	No	Yes	Yes
<i>Firm FE</i>	No	No	Yes
<i>Industry FE</i>	Yes	Yes	No
<i>Year FE</i>	Yes	Yes	Yes
<i>N</i>	15,535	15,535	15,024
<i>Pseudo R²/Adj_R²</i>	0.0105	0.0264	0.0832

Notes: Standard errors are corrected for heteroskedasticity and clustering at the firm level (t-statistics are given in parentheses). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

quality, namely *Opinion* and AQ , are reported in Figs. 2 and 3, respectively. Given the high correlation coefficient of 0.8417 between the two measures of audit quality, the parallel trend plots for the two dependent variable measures are similar. Figs. 2 and 3 show that the differences in IID and audit quality are not significant between the treatment and control groups in the 3 years prior to the implementation of the IID guidelines. There is a significant improvement in audit quality in the treatment group after the implementation of the guidelines, with the significance of industry disclosure gradually increasing over the 6 years after implementation. These findings confirm the effectiveness of the guidelines in improving audit quality, and the parallel trend assumption is satisfied.

4.3.2. Alternative measures of the main variables

A robustness test is conducted by replacing the measure of audit quality with the measure of financial restatement ($Restatement_{i,t}$) in the current year, in line with Rajgopal et al. (2021). The value of $Restatement_{i,t}$ is 1 if the firm has a financial restatement in the current year and 0 otherwise. The regression results are shown in Table 4. The results indicate that IID remains significantly positively related to audit quality with a decrease in the probability of a firm having a financial restatement. The results of the robustness test support the main findings reported in Table 3 and provide further evidence of the effectiveness of IID in improving audit quality.⁵

⁵ Columns (1) and (2) in Table 4 list the results after controlling for industry-year fixed effects using the logit model for regression, and column (3) lists the OLS model results after controlling for firm-year fixed effects when too many sample observations are lost using the logit model. The results are also largely consistent when controlling for firm-year fixed effects using the logit model.

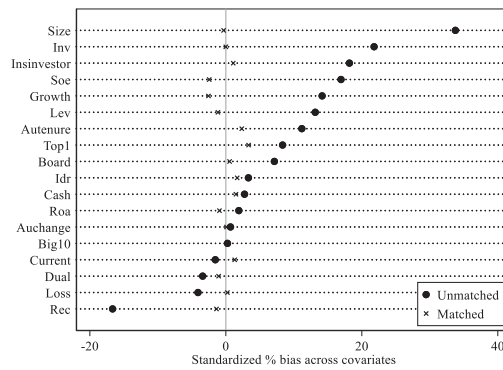


Fig. 4. Cross-sectional PSM equilibrium test.

4.3.3. Propensity score matching

To address possible endogeneity issues, such as reverse causality and omitted variables, the propensity score matching and differences-in-differences (PSM-DID) method is adopted to construct a sample of firms matched with specific firms implementing the guidelines. Two main concepts are considered for PSM. The first is cross-sectional matching, which treats panel data as cross-sectional data before matching. The second is period-by-period matching, which matches data on a year-by-year basis. The specific matching process is as follows. First, all control variables in Model (1) are selected as covariates. Second, different matched datasets are obtained according to the two matching methods: the radius is set to 0.05 and the 1:2 nearest neighbor matching method without replacement is adopted. For cross-sectional matching, the nearest neighbor matching method is used to find the best control group for the guideline pilot enterprises that meet the common support conditions. The non-common aspects are removed to obtain a new dataset. For period-by-period matching, the guideline pilot enterprises are matched year by year, and the year-by-year data are then vertically merged to form a new dataset. Third, the two sets of data are tested separately for balance to check matching effectiveness. The cross-sectional matching effects of the two audit quality measures ($Opinion_{i,t}$ and $AQ_{i,t}$) are shown in Fig. 4. The standardized mean deviation of all matched variables after matching is less than 5%, which satisfies the criterion of less than 10%, indicating that the PSM process satisfies the requirement of the balance test. Fourth, the post-PSM data are used to re-estimate the impact of IID on audit quality. After controlling for firm-year fixed effects, the regression results are as shown in columns (1)–(4) of Table 5. Regardless of whether cross-sectional matching or period-by-period matching is selected for PSM, the relationship between IID and audit quality ($Opinion_{i,t}$ and $AQ_{i,t}$) shows a significant positive correlation, and the baseline findings of this study hold.

4.3.4. Placebo test for changed policy shocks

Although the quasi-natural experiment controls for firm characteristics related to IID implementation, there may still be unobservable potential factors that affect the assessment of the guidelines' effectiveness. To ensure the robustness of the policy estimates, the guideline pilot industries are randomized and the policy shock is repeated 500 times to obtain the kernel density of 500 sets of $Post$ values and their p -values, with $Opinion_{i,t}$ as the dependent variable. The results, depicted in Fig. 5, show that the coefficients after 500 random shocks are mainly concentrated around 0,⁶ and the p -values are significantly less than 0.1 only 47 times, which is a small percentage of the total number of observations, namely 20,413. The regression results obtained after a particular randomized policy shock are shown in columns (5) and (6) of Table 5, where $Random*Post$ is no longer significant. This indicates that the effect of the policy is not significantly influenced by underlying factors, and the main regression results are somewhat robust.

⁶ The coefficients and p -values after 500 random shocks with $AQ_{i,t}$ as the dependent variable are generally consistent with the results reported in Fig. 5 with $Opinion_{i,t}$ as the dependent variable, and they are not repeated due to space constraints.

Table 5
Robustness tests: PSM-DID and placebo test.

		PSM-DID				Placebo test	
		<i>Opinion</i>	<i>Opinion</i>	<i>AQ</i>	<i>AQ</i>	<i>Opinion</i>	<i>AQ</i>
		Cross-sectional matching (1)	Year-by-year matching (2)	Cross-sectional matching (3)	Year-by-year matching (4)	Randomization policy shocks (5) (6)	
<i>Post</i>		0.0140*** (3.1931)	0.0153*** (2.634)	0.0174** (1.9840)	0.0192* (1.737)		
<i>Random*post</i>						0.0036 (1.221)	0.0094 (1.571)
<i>Constant</i>		0.3008*** (4.6045)	0.3118*** (2.621)	1.3447*** (10.2967)	1.3859*** (6.159)	0.3013*** (4.613)	1.3365*** (10.244)
<i>Controls</i>	Yes		Yes	Yes	Yes	Yes	Yes
<i>Firm FE</i>	Yes		Yes	Yes	Yes	Yes	Yes
<i>Industry FE</i>	No		No	No	No	No	No
<i>Year FE</i>	Yes		Yes	Yes	Yes	Yes	Yes
<i>N</i>		19,793	20,294	19,793	20,294	19,798	19,798
<i>Adj_R²</i>		0.3182	0.0594	0.2252	0.0609	0.3187	0.2254

Notes: Standard errors are corrected for heteroskedasticity and clustering at the firm level (t-statistics are given in parentheses). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

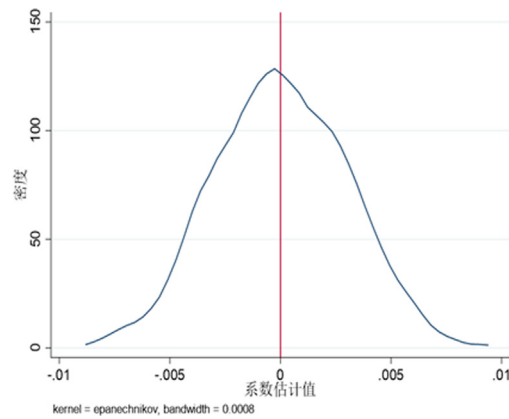


Fig. 5. Distribution of coefficient estimates for randomized policy shocks.

Table 6
Single-industry information disclosure and audit quality.

	<i>Opinion</i> (1)	<i>Opinion</i> (2)	<i>Opinion</i> (3)	<i>AQ</i> (4)	<i>AQ</i> (5)	<i>AQ</i> (6)
<i>Post</i>	0.5426** (2.270)	0.5876** (2.320)	0.0111** (2.268)	0.0115* (1.649)	0.0137** (2.027)	0.0154* (1.720)
<i>Constant</i>	-5.5576*** (-7.275)	3.7269* (1.781)	0.3281*** (4.483)	1.0352*** (463.079)	1.3843*** (28.351)	1.2974*** (9.754)
<i>Controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Firm FE</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Industry FE</i>	No	No	No	No	No	No
<i>Year FE</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	16,767	16,767	16,281	16,798	16,798	16,281
<i>Adj_R²</i>	0.1440	0.3121	0.3259	0.0067	0.0767	0.2509

Notes: Standard errors are corrected for heteroskedasticity and clustering at the firm level (t-statistics are given in parentheses). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

4.3.5. Excluding sample companies operating in cross-industry activities

Cross-industry business development is common practice among enterprises classified by the China Securities Regulatory Commission (CSRC) but may not be fully reflected in the industry classification of a company registered with the CSRC, leading to biased research designs. To address this issue, companies with multiple main business operations are removed, while those with a single main business operation are retained to ensure that the sample companies operate in a single industry. The impact of IID on audit quality in companies operating in a single industry is re-tested. The regression results based on the subsample without enterprises operating across industries are reported in Table 6. IID is still found to be significantly positively related to audit quality at the 10% or 5% level, indicating that the results of the main regression are somewhat robust after taking into account firms that operate in different industries. In summary, these findings suggest that the implementation of the IID guidelines can improve audit quality in companies with and without multiple main business operations.

5. Further analysis

The main tests and robustness tests confirm that IID can significantly improve the audit quality of firms, excluding the strategic and selective disclosure of industry information that leads to information redundancy. According to the hypothesis development framework, IID contributes to audit quality by affecting auditor independence, auditor professionalism and audit effort.

Table 7
Mechanism test: IID quantity and quality, audit fees and audit hours.

	<i>Hangyeword</i> (1)	<i>Nohangye</i> (2)	<i>TiEud</i> (3)	<i>Auditfee</i> (4)	<i>Audittime</i> (5)
<i>Post</i>	0.040*** (3.699)	0.025*** (3.766)	0.009*** (2.578)	1.2834** (2.397)	0.0110 (1.513)
<i>Constant</i>	1.757*** (10.753)	2.323*** (23.034)	1.207*** (22.244)	481.6392*** (24.919)	3.2236*** (29.905)
<i>Controls</i>	Yes	Yes	Yes	Yes	Yes
<i>Firm FE</i>	Yes	Yes	Yes	Yes	Yes
<i>Year FE</i>	Yes	Yes	Yes	Yes	Yes
<i>N</i>	19,045	19,045	17,240	19,798	19,749
<i>Adj_R²</i>	0.743	0.819	0.407	0.8320	0.3065

Notes: Standard errors are corrected for heteroskedasticity and clustering at the firm level (t-statistics are given in parentheses). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

If IID reduces auditor independence, auditors should be less likely to issue a non-standard unqualified opinion after the issuance and implementation of the guidelines. However, the main regression analysis of IID and audit quality confirms that IID ($Post_{i,t}$) is significantly positively related to audit quality ($Opinion_{i,t}/AQ_{i,t}$). In other words, after IID, auditors issue more non-standard unqualified opinions, which in turn increases auditor independence and enhances firms' audit quality. This suggests that IID enhances audit quality by increasing auditor independence. To further analyze the mechanism of the effect of IID on audit quality and test for related heterogeneity, we consider two channels in this study: auditor professionalism and audit effort.

5.1. Auditor professionalism: IID quantity and quality

To verify whether the implementation of the IID guidelines can improve audit quality by increasing the quantity and quality of industry-related information disclosed by enterprises, we first obtain 500 annual reports by stratifying the sample according to the 2012 industry classification of the CSRC for the 2010–2021 period. These reports are manually read and keywords related to IID are obtained.⁷ Next, we use Python software to search the annual reports of all sample companies covering the 2010–2021 period for two types of text related to industry information: (1) the frequencies of 755 phrases or terms containing the word “industry,” such as “sunrise industry” and “traditional industry,” expressed in terms of *Hangyeword*; (2) the frequencies of 977 related phrases or words that do not contain the word “industry” but have obvious industry information and industry connotations, such as “leader” and “monopoly position,” expressed in terms of *Nohangye*. In the annual report, the more frequent the occurrence of these two types of text containing industry information, the more industry information is disclosed. We use these data to determine whether there is a significant increase in the amount of industry information disclosed after the implementation of the guidelines. The regression results are reported in Table 7, which shows that the number of words with industry-related information disclosure connotations increases significantly after the implementation of the guidelines. This indicates that the promulgation of the guidelines promotes the disclosure of more industry information.

In addition to the quantity of industry-related information disclosed, the quality of such information is important in evaluating the impact of IID on audit quality. Studies show that capital markets respond positively to text similarity in the management discussion and analysis sections of financial reports (Brown and Tucker, 2011). Moreover, higher 10-K text similarity is associated with significantly lower earnings volatility and stock trading volumes for firms, and the overreaction of the capital market to repetitive information can cause earnings reversals (Tetloc, 2011). This suggests the importance of the information content of annual

⁷ By manually searching for keywords directly related to the word “industry” and keywords that do not contain the word “industry” but have obvious industry comparison implications, 2,056 keywords related to industry information disclosure are ultimately obtained after aggregating and removing duplicate keywords; these include “industry information,” “peer information” and “industry information.”.

Table 8
IID quantity and audit quality.

	<i>Opinion</i> Large quantity of disclosures (1)	<i>Opinion</i> Small quantity of disclosures (2)	<i>AQ</i> Large quantity of disclosures (3)	<i>AQ</i> Small quantity of disclosures (4)
<i>Post</i>	0.0205*** (3.195)	0.0121 (1.543)	0.0172** (2.082)	0.0181 (1.504)
<i>Constant</i>	0.2899*** (2.697)	0.1505 (1.323)	1.2755*** (17.735)	1.4737*** (23.105)
<i>Controls</i> Yes		Yes	Yes	Yes
<i>Firm FE</i> Yes		Yes	Yes	Yes
<i>Year FE</i> Yes		Yes	Yes	Yes
<i>N</i>	9,920	9,182	9,920	9,182
<i>Adj_R²</i>	0.3245	0.3564	0.1720	0.2918
<i>Pdiff</i>		-0.008***		-0.003**

Notes: Standard errors are corrected for heteroskedasticity and clustering at the firm level (t-statistics are given in parentheses). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

reports. To measure IID quality, we use the text similarity approach. First, using Python, we obtain sentences containing the keywords from the annual reports of the sample firms to form the text of the relevant IID. Then, we process the text with *jieba* subscripts to remove punctuation marks and redundant numbers. We compare the Euclidean distance in the IID text vector of the current year and the previous year of an enterprise, with reference to Matsumura et al. (2006) and Ho et al. (2014). This indicates the degree of similarity between the texts of the IID of the same enterprise in the current year and previous year, after the issuance of the guidelines, as a proxy for the quality of IID in the current year.

Specifically, before calculating text similarity, we use the term frequency-inverse document frequency (TF-IDF) weighting technique to transform the text into a vector, and the Euclidean distance of the IID text vector is measured ($TiEud_{ij} = \sqrt{\sum_k (X_{ik} - X_{jk})^2}$). Large Euclidean distance values indicate greater distance between the two text vectors, lower similarity between the papers and greater textual information content. We use these data to test whether the quality of the industry information disclosed by companies improves after IID. The regression results are reported in column (3) of Table 7, which shows that the Euclidean distance value of the disclosed industry information increases significantly after the implementation of the guidelines. This indicates that the promulgation of the guidelines increases the quality of the industry information disclosed by enterprises to the public.

5.2. Audit effort: Audit fees and audit hours

The implementation of the guidelines is innovative, mandatory, universal and legitimate, leading both auditors and enterprises to pay attention to and increase their investment in audit effort. With reference to Bills et al. (2016) and Gong et al. (2016), we test the impacts of IID by using the natural logarithm of audit fees to represent audit effort (*Auditfee*) and the natural logarithm of audit hours to represent audit time (*Audittime*).⁸

The regression results are reported in columns (4) and (5) of Table 7, which show that audit fees increase significantly after the issuance of the guidelines, while audit hours increase but not significantly. This indicates that companies pay attention to and increase their audit investments to hire more professional auditors. An increase in audit fees indicates an increase in a firm's financial investment in auditing and the importance that it places on auditing.

⁸ The data are obtained from the CSMAR database. The number of audit hours is calculated as the natural logarithm of the number of days between the end of the accounting period (31 December) and the audit closing date of the following year, which is defined as the auditor's work input (*Audittime*) in the audit of the company's annual report. A longer interval means that the auditor invests more time in the audit of the annual report.

Some studies use the natural logarithm of audit fees as a proxy for audit quality (DeAngelo, 1981; Dao et al., 2012; Rajgopal et al., 2021), suggesting that the more a firm spends on auditing, the higher its audit quality. This demonstrates that audit fees are one of the channels through which IID affects audit quality.

5.3. Cross-sectional analysis

In this section, we conduct further analysis to examine whether the impact of IID on audit quality varies by auditor characteristics, whether the tone of IID is negative and the industry in which the firm operates. By examining these factors, we enhance our understanding of the mechanisms underlying the impact of IID on audit quality and identify potential moderating factors that affect the relationship between IID and audit quality. In the following sections, we report the results of the cross-sectional analysis and discuss their implications for our findings.

5.3.1. IID quantity and quality

To further investigate the relationship between IID quantity and audit quality, we divide the sample firms into a high-IID group and a low-IID group based on the mean frequency of the word “industry.” We then examine whether the improvement in audit quality is affected by the number of IIDs. Table 8 shows that IID is significantly positively related to audit quality in the high-IID group but not in the low-IID group. Moreover, the between-group coefficient difference test indicates that the difference in the relationship between IID and audit quality is significant between the two groups. This suggests that the greater the amount of industry information disclosed, the more likely the auditor is to issue a non-standard audit opinion, indicating higher audit quality. This confirms that increased auditor professionalism due to IID contributes to the effect of IID on audit quality. If the industry information disclosed is informative and contributes to the auditor’s cumulative knowledge, the greater the quantity or the higher the quality of IIDs, the greater the improvement in audit quality.

To further investigate the relationship between IID quality and audit quality, we divide the sample firms into high and low groups based on the mean Euclidean distance of the IID text. The regression results are reported in Table 9. After controlling for firm-year fixed effects, we find that IID is significantly positively related to audit quality in the groups with lower similarity (higher industry information quality), but not in any of the groups with higher similarity (lower industry information quality). Furthermore, the IID quality groupings all pass the between-group coefficient difference test (*Pdiff*) at the 1% level. Lower similarity of IID texts indicates a greater difference in industry information texts between the current year and the previous year of the guidelines’ implementation, leading to the disclosure of more valid industry information and the higher validity of the information obtained by the auditor. This, in turn, leads to higher-quality audits. These

Table 9
IID quality and audit quality.

	<i>Opinion</i> Low similarity (1)	<i>Opinion</i> High similarity (2)	<i>AQ</i> Low similarity (3)	<i>AQ</i> High similarity (4)
<i>Post</i>	0.0207*** (3.180)	0.0012 (0.172)	0.0335** (2.433)	-0.0049 (-0.402)
<i>Constant</i>	0.4422*** (4.634)	0.1525 (1.387)	1.4948*** (7.420)	1.0770*** (5.520)
<i>Controls</i>	Yes	Yes	Yes	Yes
<i>Firm FE</i>	Yes	Yes	Yes	Yes
<i>Year FE</i>	Yes	Yes	Yes	Yes
<i>N</i>	11,251	7,443	11,251	7,443
<i>Adj_R²</i>	0.3495	0.2756	0.2155	0.2437
<i>Pdiff</i>		-0.020***		-0.038***

Notes: Standard errors are corrected for heteroskedasticity and clustering at the firm level (t-statistics are given in parentheses). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 10
Audit institutions and audit quality.

	<i>Opinion</i> Top Ranking (1)	<i>Opinion</i> Bottom Ranking (2)	<i>AQ</i> Top Ranking (3)	<i>AQ</i> Bottom Ranking (4)
<i>Post</i>	0.0197*** (2.724)	0.0099 (1.634)	0.0320** (2.033)	0.0068 (0.650)
<i>Constant</i>	0.4294*** (4.001)	0.0545 (0.537)	1.5962*** (6.822)	1.0232*** (5.832)
<i>Controls</i>	Yes	Yes	Yes	Yes
<i>Firm FE</i>	No	No	Yes	Yes
<i>Industry FE</i>	Yes	Yes	No	No
<i>Year FE</i>	Yes	Yes	Yes	Yes
<i>N</i>	9,159	8,999	9,159	8,999
<i>Adj_R²</i>	0.3556	0.3666	0.2610	0.2414
<i>Pdiff</i>		-0.010*		-0.026**

Notes: Standard errors are corrected for heteroskedasticity and clustering at the firm level (t-statistics are given in parentheses). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 11
Auditor industry expertise and audit quality.

	<i>Opinion</i> Outstanding industry expertise (1)	<i>Opinion</i> Lack of industry expertise (2)	<i>AQ</i> Outstanding industry expertise (3)	<i>AQ</i> Lack of industry expertise (4)
<i>Post</i>	0.0229*** (3.133)	0.0071 (1.197)	0.0243* (1.739)	0.0069 (0.575)
<i>Constant</i>	0.2755*** (2.591)	0.2789*** (3.021)	1.0205*** (5.012)	1.4591*** (7.710)
<i>Controls</i>	Yes	Yes	Yes	Yes
<i>Firm FE</i>	Yes	Yes	Yes	Yes
<i>Year FE</i>	Yes	Yes	Yes	Yes
<i>N</i>	8,448	11,021	8,448	11,021
<i>Adj_R²</i>	0.2655	0.3675	0.2104	0.2607
<i>Pdiff</i>		-0.032***		-0.017*

Notes: Standard errors are corrected for heteroskedasticity and clustering at the firm level (t-statistics are given in parentheses). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

findings confirm that high-quality IID increases auditor professionalism, which contributes to the effect of IID on audit quality.

5.3.2. Audit institutions and auditor characteristics

In addition to IID quantity and quality, the ranking of audit firms can affect auditor professionalism, which in turn may affect audit quality. The ranking of audit firms has a strong reputational effect, as audit firms such as the international “Big Four” or domestic “Top Ten” build a reputation and receive reputational rents due to their high rankings. This provides material security and reputational incentives for audit firms and auditors to perform their audit work. Moreover, the disclosure of industry information greatly enhances the ability of auditors to identify and report problems and improves audit efficiency and audit quality (Chan and Wong, 2002).

Table 12
IID tone features.

	<i>Opinion</i> Positive tone (1)	<i>Opinion</i> Negative tone (2)	<i>AQ</i> Positive tone (3)	<i>AQ</i> Negative tone (4)
<i>Post</i>	0.0139 (1.426)	0.0193*** (2.844)	0.0113 (0.712)	0.0327** (2.485)
<i>Constant</i>	0.3763 (1.641)	-0.0577 (-0.404)	1.4193*** (3.281)	0.7350*** (3.078)
<i>Controls</i>	Yes	Yes	Yes	Yes
<i>Firm FE</i>	Yes	Yes	Yes	Yes
<i>Year FE</i>	Yes	Yes	Yes	Yes
<i>N</i>	8,473	8,594	8,473	8,594
<i>Adj_R²</i>	0.3237	0.2209	0.2681	0.2442
<i>Pdiff</i>		-0.005***		-0.021**

Notes: Standard errors are corrected for heteroskedasticity and clustering at the firm level (t-statistics are given in parentheses). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Furthermore, auditor ranking combines various factors, such as the competence of all auditors, and the greater the auditor's competence, the stronger their ability to obtain valid information (Reichelt and Wang, 2010). Similarly, the stronger the auditor's ability to obtain effective information after IID, the more significant the improvement in the audit quality of the firm. To examine the impact of auditor ranking on the relationship between IID and audit quality, we divide audit firms into top- and bottom-ranking auditors,⁹ based on the median of their overall score. The results of the sub-group regressions are presented in Table 10. After controlling for firm-year fixed effects, the effect of IID on audit quality is found to be more pronounced in the top-ranking auditor sub-group than in the bottom-ranking sub-group. The between-group coefficient differences across auditor size sub-groups are at least at the 10% level (*Pdiff*).

Auditors with industry expertise have a professional advantage in their audit work and can capture more valid information about the industry after the issuance of the guidelines than other auditors. Additionally, companies with greater auditor industry expertise tend to have higher audit quality than those with less (Cohen et al., 2014). To measure auditor industry expertise, we use the proportion of the audit client's total assets to all assets in the client firm's industry (IPSA). A value of 1 is assigned when the IPSA is greater than the mean, indicating that the auditor has industry expertise and 0 otherwise. Table 11 presents the results after controlling for firm-year fixed effects. The results indicate that IID is significantly positively related to audit quality in the sub-group with greater auditor industry expertise, and it is not significant in the sub-group in which industry expertise is lacking. As shown in Table 11, the between-group coefficient differences are at least at the 10% level (*Pdiff*). These findings suggest that auditor industry expertise plays a critical role in the relationship between IID and audit quality.

5.3.3. Tone and industry-specific features of IID

Besides the factors discussed above, the characteristics of the industry information disclosed by firms themselves may influence audit quality. Thus, we analyze whether there are differences in the impact of IID on audit quality in the context of different tones and industry characteristics.

Compared with standardized financial information, the disclosure of industry operating information, a type of non-standardized textual information, can provide a better complementary explanation and convey greater information content (Baginski et al., 2016). However, as textual information is not subject to disclosure rules or auditing procedures, it has relatively low transmission and violation costs. It can be easily manipulated by

⁹ The ranking of audit firms is based on their audit income, asset valuation income, number of certified public accountants, completion rate of training, number of reserve candidates for leading talent, minus points, number of branch offices, number of practitioners, business income per capita, number of partners, number of persons aged below 30, number of persons aged 30–50, number of persons aged above 50, number of persons with a Master's degree or above and number of persons with a Bachelor's degree or below, with corresponding weights to obtain a comprehensive score.

Table 13
IID and audit quality for firms with different levels of R&D expenditure.

	<i>Opinion</i> High R&D (1)	<i>Opinion</i> Low R&D (2)	<i>AQ</i> High R&D (3)	<i>AQ</i> Low R&D (4)
<i>Post</i>	0.0006 (0.109)	0.0375*** (2.740)	-0.0018 (-0.175)	0.0525** (2.011)
<i>Constant</i>	0.3587** (2.101)	0.2290 (0.867)	1.7658*** (4.198)	0.7482 (1.587)
<i>Controls</i>	Yes	Yes	Yes	Yes
<i>Firm FE</i>	Yes	Yes	Yes	Yes
<i>Year FE</i>	Yes	Yes	Yes	Yes
<i>N</i>	7,914	7,457	7,914	7,457
<i>Adj_R²</i>	0.3283	0.3122	0.2509	0.2146
<i>Pdiff</i>		0.037***		0.054***

Notes: Standard errors are corrected for heteroskedasticity and clustering at the firm level (t-statistics are given in parentheses). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

the managers of listed companies, becoming a means of impression management, and its reliability is difficult to discern (Huang et al., 2014). In the linguistic context of China, which values tone, the negative tone of textual information may be significantly positively related to a company's future earnings, excess stock returns and stock trading volumes (Loughran and McDonald, 2011; Davis et al., 2015; Bochkay et al., 2019). However, in markets with information asymmetry, a positive tone is not always a credible positive signal; it may be a biased signal through which managers deliberately mislead investors to conceal bad news or for other private reasons (Larcker and Zakolyukina, 2012; Huang et al., 2014). Therefore, the effect of IID tone on audit quality requires further testing.

We follow Henry and Leone (2016) and use the difference in the number of words with a positive and negative tone in IIDs divided by the sum of the two to denote the negative tone of IIDs. To examine whether the tone of IID texts affects audit quality, we divide the sample into two groups according to tone. The regression results are shown in Table 12, which indicates that IID has a significant positive relationship with audit quality in the group with a negative tone but not in the group with a positive tone. Furthermore, as shown in Table 12, the between-group coefficient difference (*Pdiff*) is at least at the 10% level. These findings suggest that IID texts with a negative tone carry greater information content and provide more valuable information for auditors' work. In contrast, IID texts with a positive tone have less valuable information, which also indicates that there is generally a degree of positive tone manipulation in IID by management. Therefore, when examining the impact of industry information on audit quality, it is important to consider IID tone.

The impact of IID on audit quality may differ across industries based on the relevance of operating information to financial information. Besides technical information, a firm's operating information mainly includes details that provide the right holder with a competitive advantage, such as information about the firm's fixed assets, sales, R&D expenditure and growth (Jefferson and Rawski, 1994). As most firms with a small proportion of fixed assets are new technology-based firms, their operating information is relatively opaque (Licht and Nerlinger, 1998), making it difficult for external institutions such as auditors to assess their business risks and investment returns. In contrast, the majority of enterprises with a large proportion of fixed assets are low value-added manufacturing enterprises, which rely more on IID than new technology-based enterprises with high added value. These two types of enterprises may therefore rely on industry information, which may impact audit quality differently. To explore this issue, we use the R&D expenditure of firms to determine whether they are technology-based firms; specifically, we consider companies' R&D expenditure as a percentage of their total expenditure.

The results of the sub-group regressions are presented in Table 13. The empirical results show that IID significantly improves audit quality in firms with low R&D expenditure, while the effect in firms with high R&D expenditure is not significant. This indicates that companies with low R&D expenditure are more likely to be manufacturing companies that rely more on industry information, while companies with high R&D expenditure are less likely to rely on industry information and mainly rely on their own proprietary technology to

achieve corporate development. Therefore, IID is more likely to improve audit quality in firms with low R&D expenditure, and the between-group coefficient differences are at the 1% level (*Pdiff*).

6. Conclusions and insights

Introduced in 2013, the reformed SSE and SZSE disclosure regulations aim to ensure the provision of more industry-related information. Using Chinese companies listed from 2010 to 2021, this study explores the impact of IID on audit quality. Our empirical results show that the implementation of the IID guidelines significantly improves audit quality. The study confirms the positive impact of IID on audit quality and demonstrates the effectiveness of the implementation of industry-specific disclosure guidelines. This suggests that regulators should continue to strengthen the implementation of the guidelines and regulate the further disclosure of industry information. Additionally, the findings show that IID can reduce audit risk and increase auditor effort, leading to higher audit quality. Overall, this study expands research on the economic consequences of IID from the perspective of audits and the factors influencing audit quality. The findings provide valuable insights for regulators, enterprises and other stakeholders in the capital markets. For regulators, the SSE and SZSE could strengthen the implementation of the guidelines to improve the disclosure quality of industry information and to generate more positive spillover effect in the capital market. Besides auditors, the stakeholders would like pay more attention to enterprises' IID when making investment decisions.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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