

Does environmental disclosure have an auditing effect?

Environmental disclosure

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Abstract

Purpose – The purpose of this paper is to investigate whether firms with high environmental disclosure have a low possibility of non-standard audit opinions and audit fees and whether this trend is more obvious after than prior to the Measures for the Disclosure of Environmental Information (Measure) implemented in 2008.

Design/methodology/approach – Based on the Measures implemented in 2008, the authors select data for the listed manufacturing firms from 2004 to 2006 (Pre-Measure) and from 2009 to 2011 (Post-Measure) as research samples to investigate the relationships between environmental disclosures, audit opinions and audit fees with difference in difference models. In addition, we also consider the influence of media attention, the polluting industry and internal control on the audit effect of environmental disclosure.

Findings – The results show that the level of environmental disclosure is significantly negatively correlated with the possibility of issuing non-standard audit opinions and audit fees after measure is implemented, especially hard environmental information. Further evidence indicates that the auditing effect of environmental disclosures is stronger on firms that receive less media attention, in firms with better internal controls, and in firms belonging to industries with heavy pollution.

Originality/value – In the Chinese setting, a high level of environmental information disclosures can effectively reduce the audit risk and lead to a high possibility of standard audit opinions and low audit fees. This effect is pronounced after issuing Measure. The conclusions suggest that measure and increasing environmental disclosure have an obvious positive audit effect and that firms should be forced or encouraged to disclose more environmental information from the perspective of auditors in China.

Keywords Audit fees, Environmental disclosure, Audit opinion, Audit opinion, Audit risk

Paper type Research paper

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1. Introduction

In addition to audit cost (Abbott *et al.*, 2003; Charles *et al.*, 2010), prior studies suggest that additional risk factors, including high discretionary accruals, lack of conservatism, internal control deficiencies, high short interest, political connections, high free cash flows, poor credit ratings and unethical business practices such as bribery (DeFond and Zhang, 2014), affect the audit fee pricing and audit opinion formation. Auditors adjust audit fees according to the audit risk, including both the client and auditor and charge an additional fee if the risk is more than the expected risk level (Jiang and Son, 2015). Additional risks are also important factors that influence the audit opinion (Francis *et al.*, 2005; Sengupta and Shen, 2007). However, if the client firms could show auditors that they have controlled these risks, audit fees priced by auditors would be reduced, and standard audit opinions would be gained.

The Measures for the Disclosure of Environmental Information (hereafter referred to as *Measure*) promulgated by the China Ministry of Environmental Protection in 2008 requires all heavily polluting firms that exceed the standards and total pollutant amounts to disclose the major categories of environmental information. Other firms are also encouraged to voluntarily disclose environmental information and accept supervision from the public and



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media. *Measure* not only increases the importance of environmental information but also induces auditors to pay more attention to environmental information during decision-making on audit fee pricing and audit opinion formation. After the issuance of *Measure*, more environmental disclosure may mitigate auditors' engagement risk with an information effect and a signal effect. First, environmental disclosure affects the auditor's assessment of client inherent risk. Environmental disclosures, to a certain extent, can alleviate information asymmetry between firms and auditors. *Measure* exerts tremendous public pressure on firms' managers, and to maintain legitimacy, managers tend to increase the level of environmental disclosure to respond to this pressure (Aerts and Cormier, 2009). If heavy polluting firms or environmentally sensitive firms disclose less environmental information after the issuance of *Measure* than ever, there may be a potential client business risk in these firms for auditors. Second, higher quality environmental disclosure represents less control risk and indicates managers' honesty, credibility and trustworthiness. Some studies find that large firms and state-controlled firms tend to disclose more environmental information (Clarkson *et al.*, 2008; Zeng *et al.*, 2010). It is well-known that large firms and state-controlled firms usually have a good internal control, so environmental disclosure can be regarded as an indicator of good internal control in client firms. Simultaneously, managers' honesty, credibility and trustworthiness improve auditors' assessments of the financial disclosure credibility and reduce audit efforts. Third, high-quality environmental information can mitigate the auditor business risk. *Measure* has an obvious government orientation of emphasis on environmental information. If the client firms do not disclose the environmental information sufficiently, auditors need to have the additional work to check the environmental risk to avoid litigation and reputation risk.

In practice, to reduce the audit risk, the *Auditing Standards for the Chinese Certified Public Accountants No. 1631-Consideration of Environmental Information in the Audit of Financial Statements*, issued by the Chinese Institute of Certified Public Accountants in February 2006, requires auditors to pay due attention to all significant environmental information that affects financial statements. However, whether environmental disclosures can help to reduce the audit risk, obtain standard audit opinions and lower audit fees has not been effectively resolved in the existing literature. Therefore, in the context of the promulgation of *Measure*, we explore the relationship between environmental information disclosures, audit opinions and audit fees considering the effect of *Measure*. Furthermore, we take the firms' internal and external environment into account to examine the influence of environmental information disclosures on audit opinions and audit fees. Finally, we explore the action path of environmental disclosures that influence audit opinions and audit fees. The results show that the level of environmental disclosure is significantly negatively correlated with non-standard audit opinions and audit fees. Especially, the relation is more pronounced after the promulgation and implementation of *Measure* and when hard environmental information is used consisting of monetary and quantitative measures. Further evidence also indicates that the auditing effect of environmental disclosures varies under different internal and external environment. The negative effect on audit fees and audit opinions is more significant in firms with lower media attention and higher control quality, and in firms belonging to the heavy polluting industry.

Our study contributes to the literature in the following ways:

- We explore the auditing effect of environmental disclosures by the way that environmental disclosure reduces the information asymmetry and audit risks, and then reduce the audit fees and the possibility of non-standard audit opinions. In other words, auditors can reassess the audit risk with environmental information and reduce the risk premium. Few studies have explored the effect of environmental

disclosure on audit fees and audit opinion. In fact, the client's proactive disclosure of environmental information helps to reduce the audit fees, and the client also gets a satisfactory audit opinion.

- We select *Measure* as an exogenous event because it provides a new study perspective. As environmental disclosure has no significant change before the issuance of *Measure*, we also do not observe significant changes in audit fees and opinions influenced by environmental disclosure.

After the issuance of *Measure*, the level of firms' environmental disclosure exhibits a dramatic increase, allowing the possibility to test the change in audit fees and opinions along with the increase in environmental disclosure. We find that environmental policies such as *Measure* can provide positive audit effects, and firms that comply with *Measure* can acquire fewer audit fees and have a lower possibility of non-standard audit opinions than other firms.

The remainder of this paper is structured as follows. Section 2 provides a review of the literature. Section 3 describes the hypotheses. The sample selection criteria, variables and model descriptions are presented in Section 3. Section 4 presents the empirical results. Finally, Section 5 offers concluding remarks.

2. Literature review

Classic audit fee theories show that audit fees consist of not only the costs incurred during audit procedures but also potential risks for compensation (Simunic, 1980; Houston *et al.*, 1999). Many studies have served to establish the responsiveness of audit fees to variables related to the auditee size, risk and complexity (Taylor and Simon, 1999). DeFond *et al.* (2016) conclude that three components of auditors' engagement risk, including client business risk associated with the client's survival and profitability, audit risk in which the auditor may unknowingly fail to appropriately modify his or her opinion on materially misstated financial statements, and auditor business risk of potential litigation costs from an alleged audit failure and other costs, such as fee realization and reputational effects. Wang *et al.* (2019) further classify the auditor business risks into three forms:

- (1) litigation risk, deriving from undetected material misstatements beyond a predetermined acceptable level of audit risk;
- (2) residual litigation risk, referring to potential losses associated with litigation against auditors for reasons unrelated to material misstatements; and
- (3) non-litigation risk, reflecting risks that extend beyond litigation risk and residual litigation risk and limit opportunities for future audit and non-audit revenues or damage auditors' reputations.

Stanley (2011) finds that the client business risk can impact the reliability of the financial statements (i.e. audit risk) and the auditor's expected losses (i.e. auditor business risk). Thus, the auditor's assessment of client business risk plays an important role in audit pricing (Simunic, 1980; Pratt and Stice, 1994). Stanley (2011) argues that the audit fee disclosure can be regarded as a leading indicator of the clients' business risk, and the higher perceived client risk is associated with higher audit fees (Lyon and Maher, 2005; Venkataraman *et al.*, 2008). Cho *et al.* (2017) find that auditors increase their audit efforts by modifying audit procedures and substantive tests and charge higher fees for the increased cash flow risk. More studies focus on the relation between internal control risk and audit fees and find that audit fees are significantly higher for firms that disclose material weakness in internal

control, and the remediation of a material weakness leads to a reduction in audit fees (Munsif *et al.*, 2011). Jiang and Son (2015) find that auditors adjust risk premiums as well as audit efforts in response to altered control risk, and show that the extent of risk premium adjustment varies depending on the severity of the underlying internal control problems. Yang *et al.* (2018) confirm this conclusion. They examine the association between these four risk measures derived from the risk factor section in 10-K filings and audit fees, and show that audit fees are significantly and positively related to firm-specific financial, strategic and operational risks, indicating the informativeness of corporate textual risk disclosures. Correspondingly, Enterprise Risk Management (ERM) can reduce the audit fees. Bailey *et al.* (2017) find higher-quality ERM systems incrementally reduce audit fees, audit delay, and the likelihood of late filing.

Regarding the audit opinion, most studies view that audit opinions are related to earnings management. They find that the likelihood of receiving a going-concern audit opinion is higher when the quality of accruals for a firm is low (Sengupta and Shen, 2007; Herbohn and Raganathan, 2008). However, Tsipouridou and Spathis (2014) show that audit opinions are not related to earnings management. Client firms' financial characteristics, such as profitability and size, are determinants of the ongoing concern regarding the audit opinion decision. Krishnan and Krishnan (1996) find that audit opinions are the results of the auditor's trade-offs by considering the two opposing forces: the expected costs of possible client loss if a qualified opinion is issued and the expected costs of litigation or reputation loss if a qualified opinion is not issued when it should be. They show that the auditor's litigation risk, the extent of outsider ownership, the relative importance of the client in the auditor's portfolio, and future growth are important factors in the audit opinion decision. Ireland (2003) finds that large companies, highly geared companies, and companies that have received prior year audit modifications are more likely to receive modifications. Spathis (2003) finds that the audit qualification decision is positively associated with financial information such as financial distress and with non-financial information such as firm litigation. Francis *et al.* (2005) find that information risk is an important factor influencing the audit opinion. Sengupta and Shen (2007) argue that information risk can be used in explaining auditors' decisions. There are also some studies that have researched the determinants of audit opinion decisions from auditors. Firth *et al.* (2012) note that the organizational form of audit firms can affect their opinion: a partnership firm (limited liability firm) has more (less) wealth at risk and larger (smaller) risk and liability exposure, and therefore tends to issue qualified (clean) audit opinions.

In summary, the assessment of clients' risk is the determinant of audit fees and audit opinions in the existing literature. In fact, *Measure* makes the environmental disclosure an important indicator to measure the auditors' engagement risks. Some studies have started to examine the audit effect on non-financial information including environmental disclosure. Brazel *et al.* (2009) believe that auditors can effectively use non-financial information to evaluate and identify financial statement frauds. The PCAOB (Public Company Accounting Oversight Board) has discussed the potential for non-financial information as a powerful, independent benchmark for evaluating the validity of financial statement data and recently endorsed their usage to improve fraud detection (PCAOB, 2007). Therefore, environmental matters have potential litigation and reputational damages (Johnstone and Bedard, 2001; Bedard and Johnstone, 2004), and thus auditors will receive risk premiums in their auditing fees (Jiang and Son, 2015). Chen *et al.* (2016) also find that audit fees are positively associated with the likelihood of standalone CSR report issuance, and this positive association becomes stronger when managers perceive a greater need for credibility, when CSR reports are longer

or issued with external assurance, when firms have strong CSR concerns, and when reports are issued sporadically.

Prior literature has confirmed that environmental disclosure can affect auditors' engagement risks and then influence audit fees and opinions. However, two problems persist that are not resolved in the existing research:

- (1) How do auditors react to environmental disclosure of the client firms? It is of interest whether auditors accept the effect of reducing audit risk after issuance of *Measure*. However, the available literature overlooks the effect of *Measure* that highlights the role of environmental information and exhibits some endogenous problems of causality.
- (2) How does the environmental disclosure affect audit fees and opinions?

The influential paths have not been studied in the available literature after issuance of *Measure*. Thus, we make full use of *Measure* and explore how environmental disclosure affects audit fees and opinions.

3. Theoretical analysis and hypothesis development

3.1 Environmental disclosure and audit fees

Prior studies have found that audit risk is a determinant of audit fees. As a typical non-financial information, environmental disclosure has a great influence on audit risk. Especially after the issuance of *Measure*, the importance of environmental information is becoming increasing drastic. Environmental disclosure after *Measure* can mitigate assessment of the inherent risk, control risk and auditor business risk. Wang *et al.* (2019) find that corporate social responsibility reporting affects audit fees through both information and signal effects. Thus, environmental disclosure may affect audit fees in these two ways.

On the one hand, environmental disclosure reduces the auditor's assessment of client inherent risk and is an important reference for the detection of fraudulent financial reporting with its information effect. Corporate social responsibility including environmental disclosure can reduce information asymmetry among stakeholders (Cho *et al.*, 2013; Lu and Chueh, 2015). Cormier *et al.* (2011) also find that environmental disclosure can efficiently reduce information asymmetry. Facing pressure from *Measure*, managers of client firms tend to disclose more environmental information to maintain the operating legitimacy. When the level of environmental information is high, the information asymmetry regarding the ability of sustainable development is reduced. Therefore, the audit risk is also reduced, and the audit fees charged to compensate for the audit effort are reduced accordingly. However, firms that disclose less environmental information may have some inherent risk. Thus, auditors can evaluate the client inherent risk by judging the level of environmental information. Furthermore, external auditors can use environmental information to improve fraud detection. Unlike some financial statement data, it is often difficult to conceal the manipulation of data related to NFMs (including environmental information) (Bell *et al.*, 2005), so environmental information is produced and reported by independent sources, which is different from the financial report. Thus, external auditors can consider the abnormal inconsistencies between financial statement data and environmental information to improve the detection of fraudulent financial reporting. Thus, higher environmental disclosure indicates lower audit risks that are assessed by external auditors.

On the other hand, environmental disclosure represents a corporate culture with good behavioral norms and long-term horizons from the perspective of signal effects. For firms, greater environmental disclosure means higher internal control in client firms. Many studies

results show that firms with high environmental disclosure generally have good internal control because most of these firms are large and state-controlled (Clarkson *et al.*, 2008; Zeng *et al.*, 2010). Thus, auditors also assess the control risk by the level of environmental information. For managers, good environmental disclosure practices indicate that managers can anticipate the future and act to prevent risks in the long run (Porter and Kramer, 2006). The honesty, credibility and trustworthiness of managers further improves auditors' perceptions of firms' internal control effectiveness (Guiral *et al.*, 2014), and managers' integrity of environmentally conscious firms assessed by auditors reduces audit efforts. Managers of environmentally conscious firms tend not to engage in earnings management through both accruals and real activity manipulation (Kim *et al.*, 2012) and to conceal bad news (Kim *et al.*, 2014). *Measure* clearly has government orientation with an emphasis on environmental information. Disclosing less environmental information makes auditors spend extra time searching for potential environmental risk. As environmental matters have potential litigation risks, credibility and reputational damage, ignoring or paying less attention to environmental information may lead to extra audit risks. After the issuance of *Measure*, environmental information has been the focus of attention from stakeholders. Incomplete environmental information can lead to undetected material misstatements beyond a predetermined acceptable level of audit risk (litigation risks), directly or indirectly. For example, the pending litigation of environmental lawsuit can affect the litigation risks of auditors directly. Extent studies find that material misstatements can be detected by comparing the consistence of environmental information and financial information. However, insufficient environmental information may influence the litigation risks of auditors indirectly. Furthermore, potential litigation risks from environmental matters may lead to credibility and reputational damage of auditors. Facing insufficient environmental information, auditors need to assess the extra risks and require the premium audit price. Thus, more environmental information disclosed by managers means more earnings quality (Khan and Azim, 2015), better earnings forecasts and less information uncertainty (Cormier and Magnan, 2015). For firms with a high level of environmental information, a low premium is required by auditors. Therefore, our first hypothesis is stated as follows:

- H1. *Ceteris paribus*, audit fees are negatively correlated with the level of environmental information disclosure, which is more significant after the promulgation and implementation of *Measure*.

3.2 Environmental disclosure and audit opinions

If auditors find that the client's risk is difficult to control in the acceptable range, they tend to issue the non-standard audit opinion. Thus, the non-standard audit opinion originates from an uncertain environment regarding factors such as operating risks, litigation risks and trepidation about the ability of sustainable development. Among these risks, many can be reduced by collecting sufficient audit evidence. However, some risks remain difficult to resolve, such as environmental information risk. In China, it is difficult to verify the environmental information for auditors, so the environmental information disclosed by firms is the only reference for auditors and plays an important role in the decision-making of audit opinions. On the one hand, in the process of fulfilling their social responsibilities, firms have exercised their ability to examine the external environment and address external changes and crises (Orlitzky *et al.*, 2003), which can effectively reduce operating risks. On the other hand, the disclosure of environmental information provides a good performance signal of their environmental responsibility. Khan and Azim (2015) find that because socially responsible firms expend resources for implementing CSR practices to meet social

expectations, it is expected that they will report better quality earnings by constraining earning management. Plumlee *et al.* (2015) provide evidence that voluntary environmental disclosure quality is positively associated with firm value through both the cash flow and the cost of equity components. After the promulgation and implementation of *Measure*, the level of environmental information is drastically improved (Yao and Li, 2018a, 2018b), and auditors can collect more environmental information than ever to assess the environmental risk. So environmental information can reduce the assessment of client risks and help to establish standard audit opinions. Our second hypothesis is stated as follows:

H2. *Ceteris paribus*, the possibility of non-standard audit opinions is negatively correlated with the level of environmental information disclosure, which is more significant after the promulgation and implementation of *Measure*.

4. Empirical designs

4.1 Data and sample

We select the data for the listed manufacturing firms from 2004 to 2006 and 2009 to 2011 as the research sample. We exclude 2007 and 2008 because *Measure* was issued in April 2007 and came into effect in May 2008; it is more difficult to identify the impact of *Measure* on financial constraints in those two years. We also exclude the following samples:

- specially treated firms;
- firms that have an IPO in the current year; and
- firms that lack relevant variable data.

Finally, 4263 firm-year observations are obtained. The environmental disclosure data are from the firms' annual reports, and the internal control data are from the DIB internal control and risk management database. Media attention data are from the "full text database of important Chinese newspapers" of CNKI (China National Knowledge Infrastructure), and other data are from the CSMAR (China Stock Market Trading Database) database.

4.2 Regression models

To test the impact of environmental disclosures on audit fees, we estimate models (1) and (2):

$$Fee = \beta_1 EID_{-1} + Controls + \zeta \quad (1)$$

$$Fee = \beta_1 EID_{-1} + \beta_2 Change + \beta_3 Change * EID_{-1} + Controls + \zeta \quad (2)$$

In model (1) and (2), *Fee* is the natural logarithm of audit fees. We score the *EID* according to all items about environmental information from a listed company's annual report. If the item about environmental information is monetary, it is scored as 3. If the item about environmental information is quantitative, it is scored as 2. If the item about environmental information is descriptive text without quantity information, it is scored as 1. We add up the points of all items about environmental information and obtain the overall disclosure points. To reduce the heteroscedasticity problem, we have the natural logarithm of the lag of overall disclosure points plus 1.

Model (2) is a difference-in-difference model. *Change* represents the effect of *Measure* and is equal to 1 after the issuance of *Measure*, and 0 otherwise. We focus on the direction and

significance β_3 in Model (2). If $\beta_3 < 0$, it shows that *Measure* has a negative effect on audit fees. Other control variables are selected and defined as shown in Table I.

To test the impact of environmental disclosures on audit opinions, we estimate the logistic models (3) and (4):

Variables	Definition
<i>Fee</i>	The natural logarithm of audit fees
<i>Opinion</i>	A dummy variable that equals 1 when the annual report issues a non-standard audit opinion, and 0 otherwise
<i>EID</i>	The EID is scored according to 10 items about environmental information from a listed company's annual report. If the item about environmental information is monetary, it is scored as 3. If the item about environmental information is quantitative, it is scored as 2. If the item about environmental information is text descriptive without quantity information, it is scored as 1. The points for the 10 items about environmental information are added up to generate the overall disclosure points (see Appendix in detail). To reduce the heteroscedasticity problem, the EID is calculated with the natural logarithm of the overall disclosure points plus 1
<i>EID_Soft</i>	The total score of soft disclosure items of environmental disclosure items in the Appendix. To reduce the heteroscedasticity problem, EID_Soft is calculated with the natural logarithm of the overall disclosure points plus 1
<i>EID_Hard</i>	The total score of hard disclosure items of environmental disclosure items in the Appendix. To reduce the heteroscedasticity problem, EID_Hard is calculated with the natural logarithm of the overall disclosure points plus 1
<i>Change</i>	A dummy variable that equals 1 after Measure is issued, and 0 otherwise
<i>Pollution</i>	A dummy variable that equals 1 if the firm belongs to a heavy pollution industry, and 0 otherwise
<i>Media</i>	The natural logarithm of the number of news reports in the "full text database of important newspapers" database of CNKI ((China National Knowledge Infrastructure) plus 1
<i>IC</i>	The natural logarithm of the internal control index plus 1. The internal control index comes from the DIB database
<i>Size</i>	The natural logarithm of the firm's end-of-period total assets
<i>LEV</i>	Leverage of the firm that equals the end-of-period total liability divided by the total assets
<i>MTB</i>	Market value/book value
<i>ROA</i>	Net profits for the current period/total assets at the end of the period
<i>Roc</i>	Net operating cash flow/operating income
<i>INV</i>	The natural logarithm of the year-end net inventory
<i>Cat</i>	Operating income/average current assets
<i>Loss</i>	A dummy variable that equals 1 when the firm has operating losses, and 0 otherwise
<i>CFO</i>	Net operating cash flow/total assets at the beginning of the period
<i>Crr</i>	Current assets/current liabilities
<i>INTO₋₁</i>	A dummy variable that equals 1 when $0 < ROE < = 1\%$, and 0 otherwise
<i>Date</i>	The time interval between the actual disclosure date of the current annual report and the balance sheet date (days)
<i>Merger</i>	A dummy variable that equals 1 if the firm participates in a merger or acquisition activity, and 0 otherwise
<i>Beta</i>	The risk coefficient obtained from CSMAR

Notes: According to the "Environmental Information Disclosure Guide for listed companies" (draft for comments) published by the Ministry of Environmental Protection in 2010, thermal power, iron and steel, cement, electrolytic aluminium, coal, metallurgy, chemical industry, petrochemical, building materials, paper making, brewing, pharmaceutical, fermentation, textile, leather and mining industries are the 16 categories that are considered heavy pollution industries

Table I.
Definition of
variables

$$Opinion = \beta_1 EID_{-1} + Controls + \zeta \quad (3) \quad \text{Environmental disclosure}$$

$$Opinion = \beta_1 Change + \beta_2 EID_{-1} + \beta_3 EID_{-1} * Change + Controls + \zeta \quad (4)$$

In model (3) and (4), *Opinion* is equal to 1 when the annual report issues a non-standard audit opinion, and 0 otherwise. Other variables have the same definition as model (1) and (2).

4.3 Descriptive statistics

The descriptive statistical analyses are shown in Table II. Panel A presents the descriptive statistical results for the full sample and shows that the average value of *Fee* is 13.198, the minimum value is 12.044, and the maximum value is 15.956. The average of *Opinion* is 0.057, which means that only 5.7 per cent of firms are issued non-standard audit opinions. The average value of *EID* is 0.945, and the standard deviation is 0.869, which indicates that the level of environmental disclosure of manufacturing firms is very volatile. The average value of *Pollution* is 0.580, which indicates that 58 per cent of the firms in the manufacturing industry are heavily polluting firms. The average value of *Media* is 2.115, the minimum value is 0, and the maximum value is 5.298. This results show that media attention on each manufacturing firm is quite different. The average value of *IC* is 6.417, the minimum value is 0.020, and the maximum value is 6.859. Great differences can be observed in the level of internal control among firms. Panel B and Panel C present the descriptive statistics for the main variables in 2004-2006 (*Pre-Measure*) and 2009-2011 (*Post-Measure*), respectively. The average value of *Fee* is 13.281 in 2004-2006 and 13.081 in 2009-2011, which means *Fee* has decreased over time. The average value of *Opinion* is 0.087 in 2004-2006 and 0.036 in 2009-2011, which indicates that the number of firms issuing non-standard audit opinions is decreasing. The average value of *EID* is 0.722 in 2004-2006 and 1.103 in 2009-2011, which means that the level of environmental disclosure has significantly improved after the issuance of *Measure*. The statistical results for *EID_soft* and *EID_hard* are similar to *EID*. Panel D presents the results of the analysis of variance (ANOVA) for the comparison between 2004-2006 (*Pre-Measure*) and 2009-2011 (*Post-Measure*). The ANOVA compares the data for *Fee*, *Opinion*, *EID*, *EID_soft* and *EID_hard* between *Pre-Measure* and *Post-Measure*. The results show significant differences between group variations of *Fee*, *Opinion*, *EID*, *EID_soft* and *EID_hard* at the 1 per cent level. It is suggested that after the issuance of *Measure*, audit fees, audit opinions and environmental disclosure levels and quality have more pronounced variations than prior to its issuance.

4.4 Regression analysis

4.4.1 Impact of environmental disclosure on audit opinion (or fees). To test the impact of environmental disclosure on audit fees, we run the OLS regressions for model (1) and model (2). The regression results are listed in Columns 1 and 2 in Table III. The regression results in Column 1 show that environmental disclosure is negatively correlated with audit fees at the 1 per cent level. The coefficient of *EID*Change* in Column 2 is -0.009 and is significant at the 5 per cent level. This result indicates that the promulgation of *Measure* helps to promote the negative correlation between environmental information disclosures and audit fees, and the policy change has a moderate positive effect.

To test the impact of environmental disclosures on audit opinions, we run the logistic regressions for model (3) and model (4). The regression results are listed in Column 3 and Column 4 in Table III. The regression results in Column 3 show that environmental disclosures are negatively correlated with the non-standard audit opinions at the 5 per cent significance level. The coefficient of *EID*Change* in Column 4 is -0.101 and is significant at

Variable	N	Mean	Min	P25	Median	P75	Max	SD
<i>Panel A: Full samples</i>								
Fee	4263	13.198	12.044	12.766	13.122	13.459	15.956	0.631
Opinion	4263	0.057	0.000	0.000	0.000	0.000	1.000	0.231
EID	4263	0.945	0.000	0.000	1.099	1.609	2.890	0.869
EID_soft	4263	0.245	0.000	0.000	0.000	0.693	1.792	0.398
EID_hard	4263	0.825	0.000	0.000	0.693	1.386	2.833	0.860
Pollution	4263	0.580	0.000	0.000	1.000	1.000	1.000	0.494
Media	4263	2.115	0.000	1.386	2.079	2.833	5.298	1.166
IC	4263	6.417	0.020	6.466	6.538	6.586	6.859	0.809
Size	4263	21.487	19.289	20.751	21.371	22.075	25.377	1.090
LEV	4263	0.476	0.054	0.337	0.489	0.619	0.944	0.195
ROA	4263	0.038	-0.220	0.012	0.036	0.068	0.209	0.195
Beta	4263	1.110	0.422	0.971	1.128	1.270	1.622	0.239
INV	4263	19.478	14.125	18.666	19.421	20.242	23.599	1.346
Roc	4263	0.071	-0.786	0.011	0.066	0.138	0.841	0.152
Crr	4263	1.925	0.248	0.961	1.324	1.941	15.036	2.109
Loss	4263	0.102	0.000	0.000	0.000	0.000	1.000	0.302
Merger	4263	0.639	0.000	0.000	1.000	1.000	1.000	0.480
MTB	4263	1.764	0.232	0.751	1.317	2.232	7.901	1.467
Cat	4263	1.523	0.131	0.849	1.283	1.936	6.188	0.985
Date	4263	4.435	3.219	4.317	4.489	4.682	4.787	0.317
CFO	4263	0.054	-0.239	0.008	0.049	0.100	0.335	0.087
INTO_1	4263	0.050	0.000	0.000	0.000	0.000	1.000	0.219
<i>Panel B: Before Measure (2004-2006)</i>								
Fee	1764	13.281	12.044	12.899	13.199	13.567	15.956	0.613
Opinion	1764	0.087	0.000	0.000	0.000	0.000	1.000	0.282
EID	1764	0.722	0.000	0.000	0.000	1.386	2.890	0.826
EID_soft	1764	0.138	0.000	0.000	0.000	0.000	1.792	0.325
EID_hard	1764	0.647	0.000	0.000	0.000	1.386	2.833	0.809
<i>Panel C: After Measure (2009-2011)</i>								
Fee	2499	13.081	12.044	12.612	12.948	13.337	15.956	0.639
Opinion	2499	0.036	0.000	0.000	0.000	0.000	1.000	0.185
EID	2499	1.103	0.000	0.000	1.386	1.946	2.833	0.864
EID_soft	2499	0.320	0.000	0.000	0.000	0.693	1.792	0.426
EID_hard	2499	0.950	0.000	0.000	1.386	1.609	2.773	0.872
Variable	Source	SS	Df	MS	F-value	P-value		
<i>Panel D: ANOVA (before and after the promulgation of Measure)</i>								
Fee	Between groups	41.067	1	41.067	105.38	0.000		
	Within groups	1660.587	4261	0.390				
	Total	1701.654	4262	0.399				
Opinion	Between groups	2.702	1	2.702	51.05	0.000		
	Within groups	225.560	4261	0.053				
	Total	228.262	4262	0.054				
EID	Between groups	1666.382	1	1666.382	180.55	0.000		
	Within groups	39326.882	4261	9.229				
	Total	40993.264	4262	9.618				
EID_soft	Between groups	90.449	1	90.449	182.81	0.000		
	Within groups	2108.217	4261	0.495				
	Total	2198.666	4262	0.516				
EID_hard	Between groups	980.371	1	980.371	124.39	0.000		
	Within groups	33581.660	4261	7.881				
	Total	34562.031	4262	8.109				

Table II.
Description statistics

Dep	Fee		Opinion	
	(1)	(2)	(3)	(4)
<i>EID</i> ₋₁	-0.014*** (-3.50)	-0.010*** (-2.67)	-0.112** (-1.99)	-0.003 (-1.20)
<i>Change</i>		0.041 (1.31)		-0.035*** (-2.77)
<i>EID</i> ₋₁ * <i>Change</i>		-0.009** (-2.30)		-0.101** (-2.39)
<i>Pollution</i>	-0.044 (-0.52)	-0.038 (-0.45)	-1.223 (-0.61)	-0.032 (-0.96)
<i>Media</i>	-0.006 (-0.483)	-0.005 (-0.57)	0.231* (1.75)	0.002 (0.58)
<i>IC</i>	-0.028*** (-3.12)	-0.029*** (-2.80)	-0.367*** (-3.85)	-0.024*** (-5.90)
<i>Size</i>	0.437*** (17.42)	0.436*** (23.59)	0.097 (0.37)	0.021*** (2.89)
<i>LEV</i>	-0.201** (-2.06)	-0.196*** (-2.68)	3.204*** (3.45)	0.105*** (3.62)
<i>MTB</i>	0.032*** (2.98)	0.031*** (3.19)	-0.007 (-0.04)	0.010*** (2.63)
<i>Beta</i>	-0.130*** (-2.79)	-0.125*** (-3.03)	-1.101** (-2.00)	-0.009 (-0.53)
<i>ROA</i>	-0.536* (-1.69)	-0.562** (-2.17)	-8.954*** (-2.78)	-0.361*** (-3.53)
<i>Roc</i>	-0.267** (-2.24)	-0.256** (-2.33)	-0.912 (-0.86)	-0.158*** (-3.66)
<i>Crr</i>	-0.024*** (-2.96)	-0.024*** (-3.24)	-0.043 (-0.28)	0.002 (0.80)
<i>INV</i>	0.008 (0.50)	0.010 (0.70)	-0.536*** (-3.52)	-0.022*** (-3.83)
<i>Loss</i>	0.048 (0.98)	0.048 (1.10)	0.329 (0.72)	0.105*** (6.04)
<i>Merger</i>	0.077*** (4.08)	0.077*** (4.06)	-0.004 (-0.01)	-0.001 (-0.04)
<i>Cat</i>	0.131*** (2.88)	0.082*** (7.56)	-0.402** (-2.10)	-0.009** (-2.08)
<i>Date</i>	0.106*** (3.48)	0.107*** (3.50)	1.582** (2.32)	0.032*** (2.70)
<i>CFO</i>	0.421* (1.88)	0.415** (2.05)	-1.503 (-0.71)	0.171** (2.15)
<i>INT</i> ₀₋₁	0.005 (0.12)	0.007 (0.16)	-0.009 (-0.02)	-0.017 (-1.06)
<i>Fee</i> ₋₁	0.834*** (84.67)	0.827** (79.45)		
<i>Opinion</i> ₋₁			0.410*** (20.16)	0.432*** (25.28)
<i>Constant</i>	3.557*** (8.22)	3.529*** (12.06)	0.889 (0.20)	0.026 (0.22)
<i>Year</i>	YES	YES	YES	YES
<i>Industry</i>	YES	YES	YES	YES
<i>Adj. R²/ Pseudo R²</i>	0.553	0.545	0.427	0.421
<i>N</i>	2470	2470	2375	2375

Notes: *, ** and *** represent significance at the 10, 5 and 1% levels, respectively

Table III.
Impact of environmental disclosures on audit opinions (fees)

the 5 per cent level. This result shows that the promulgation of *Measure* helps to promote the negative correlation between environmental disclosures and non-standard audit opinions, and the policy change has a positive moderate effect.

The regression results are consistent with *H1* and *H2*. Thus, the level of environmental information disclosures significantly negatively affects the presentation of auditors' non-standard audit opinions and audit fees. It is more important that the promulgation of *Measure* simultaneously improves the level of environmental disclosure and promotes the negative correlation between environmental information disclosure and audit fees, as well as non-standard audit opinions.

4.4.2 Cross-sectional analyses

4.4.2.1 Media attention. From the perspective of auditors, high media attention increases the auditor's sensitivity to the reported firms. On the one hand, higher media attention increases the exposure of firms, and auditors will perceive that audit risks will increase accordingly. On the other hand, when the media attention is higher, investors will rely more on auditors, so auditors' identification, insurance pressure, and audit risk will increase. Therefore, when media attention is high, the incremental value of environmental information disclosures decreases in the face of the increased audit risk, and auditors will be relatively less dependent on it.

To verify the influence of media attention, we divide the sample data into two groups according to the median of media attention. The OLS and logistic regression analyses are performed using models (1) - (4), respectively. The regression results are shown in the Panel A of Table IV. The results show that, when media attention is low, environmental information disclosures are negatively correlated with audit fees and non-standard audit opinions at the 1 and 5 per cent significance level, respectively ($-0.009, t = -2.89$; $-0.002, t = -2.17$). In addition, after the issuance of *Measure*, the relation between environmental disclosure and audit fees, non-standard audit opinions is more pronounced than previously at the 5 per cent significance level ($-0.006, t = -2.05$; $-0.001, t = -2.23$). However, when media attention is high, the results are not significant.

4.4.2.2 Industry. In heavily polluting industries, environmental information is important non-financial information related to decision-making, and auditors will pay more attention to it; in contrast, there will be less information content for the environmental information disclosed by non-heavily polluting firms for auditors. To verify the industry influence, we divide the sample into two groups: heavily polluting firms and non-heavily polluting firms. OLS and logistic regression analyses are carried out using models (1) - (4), respectively. The regression results are shown in Panel B of Table IV. In the group of heavily polluting firms, there is a significant negative correlation between environmental information disclosures and non-standard audit opinions at the 5 per cent level, and a significant negative correlation with audit fees at the 1 per cent level. In addition, after the issuance of *Measure*, the relation between environmental disclosure and audit fees, non-standard audit opinions are more pronounced than before at the 5 per cent significance level ($-0.004, t = -2.26$; $-0.002, t = -2.23$). However, in non-heavily polluting firms, the level of environmental information disclosures is negatively correlated with non-standard audit opinions and audit fees but is not significant.

4.4.2.3 Internal control. Chan *et al.* (2008) find that firms that are labelled with internal control defect have more manipulative accrual items than other firms. The higher the quality of internal control, the higher is the accounting conservatism (Goh and Li, 2011). Therefore, when the quality of internal control is high, the reference value of environmental information disclosures is relatively high, which helps to promote the negative correlation between environmental information disclosure and audit opinions (fees). In contrast, when the quality of internal control is low, auditors need to further analyze the firm environment and the characteristics of managers to judge the implementation of the subsequent audit procedures. Therefore, the audit fees will increase.

To verify the influence of internal control, we divide the sample into two groups according to the median of the internal control index. OLS and logistic regression analysis were carried out using models (1)-(4), respectively. The regression results are shown in Panel C of Table IV. When the level of internal control is relatively high, the level of environmental disclosures is negatively correlated with the possibility of issuing non-standard audit opinions of auditors and audit fees at the 1 per cent significance level. In addition, after the issuance of *Measure*, the relation between environmental disclosure and audit fees, non-standard audit opinions are more pronounced than before at the 5 per cent significance level ($-0.002, t = -2.35$; $-0.001, t = -2.19$). However, in firms with a low level of internal control, auditors are relatively less sensitive to the environmental information.

4.4.3 Further research. In the risk-oriented audit model, the auditor must consider both the overall integrity and the managerial integrity (Beaulieu, 1994, 2001). Undertaking social responsibility and engaging in social public welfare activities indicate that firms' managers have higher ethical standards (Groening *et al.*, 2011), so the earnings management of these firms declines. Therefore, environmental information probably influences audit opinions

Dep	Low media attention		High media attention		Opinion	
	Fee (1)	Opinion (2)	Fee (1)	Opinion (2)	Fee (1)	Opinion (2)
<i>Panel A: Media attention</i>						
<i>EID₋₁</i>	-0.009*** (-2.89)	-0.014 (-1.33)	-0.002** (-2.17)	-0.001 (-1.13)	-0.020 (-0.52)	-0.003 (-0.32)
<i>Change</i>		-0.049* (-1.89)		-0.031** (-2.31)		-0.029 (-0.86)
<i>EID₋₁* Change</i>		-0.006** (-2.05)		-0.001** (-2.23)		-0.002 (-0.33)
<i>Control</i>	YES	YES	YES	YES	YES	YES
<i>Year</i>	YES	YES	YES	YES	YES	YES
<i>Industry</i>	YES	YES	YES	YES	YES	YES
<i>Adj. R²/ Pseudo R²</i>	0.397	0.398	0.444	0.317	0.552	0.317
<i>N</i>	1280	1280	1145	1145	1190	1230
<i>Panel B: Polluting</i>						
<i>Dep:</i>		Heavily polluting firms		Non-heavy polluting firms		
<i>EID₋₁</i>	-0.014*** (-2.73)	-0.017 (-1.63)	-0.002** (-2.55)	-0.001 (-0.29)	-0.014 (-1.16)	-0.018 (-1.17)
<i>Change</i>		-0.007 (-0.96)		-0.041*** (-2.85)		-0.022 (-0.73)
<i>EID₋₁* Change</i>		-0.004** (-2.26)		-0.002** (-2.23)		0.006 (0.56)
<i>Control</i>	YES	YES	YES	YES	YES	YES
<i>Year</i>	YES	YES	YES	YES	YES	YES
<i>Industry</i>	YES	YES	YES	YES	YES	YES
<i>Adj. R²/ Pseudo R²</i>	0.495	0.495	0.421	0.422	0.561	0.471
<i>N</i>	1430	1430	1374	1374	1040	1001
<i>Panel C: Internal control</i>						
<i>Dep:</i>		High level of internal control		Low level of internal control		
<i>EID₋₁</i>	-0.019*** (-5.09)	-0.021 (-1.57)	-0.096*** (-2.91)	0.001 (1.55)	-0.008 (-0.74)	-0.011 (-1.10)
<i>Change</i>		-0.034** (-1.99)		-0.002** (-2.43)		0.018 (0.69)
<i>EID₋₁* Change</i>		-0.002** (-2.35)		-0.001** (-2.19)		0.003 (-0.49)
<i>Control</i>	YES	YES	YES	YES	YES	YES
<i>Year</i>	YES	YES	YES	YES	YES	YES
<i>Industry</i>	YES	YES	YES	YES	YES	YES
<i>Adj. R²/ Pseudo R²</i>	0.526	0.526	0.303	0.302	0.411	0.344
<i>N</i>	1224	1224	1125	1125	1246	1250

Notes: *, ** and *** represent significance at the 10, 5 and 1% levels, respectively

Table IV. Influences of media attention, industry, and internal control on the relationship between environmental disclosures and audit opinions (fees)

and audit fees via earnings management. The disclosure of environmental information at a relatively high level indicates that managers have forward-looking thinking and long-term vision; this kind of manager generally pays more attention to the reputation of the firms. As a result, the manager is less likely to use his power to manipulate the financial information, and the likelihood of auditors issuing non-standard audit opinions will be lower. More reliable financial information can also reduce the amount of information collected by auditors and affect the collection of audit fees.

To examine the functional path of environmental information disclosure influencing the possibility of non-standard audit opinions and audit fees, we design model (5) and (6):

$$DA = \beta_1 EID + Controls + \zeta \quad (5)$$

$$DA = \beta_1 EID + \beta_2 Change + \beta_3 EID * Change + Controls + \zeta \quad (6)$$

With the cross-section-modified Jones model, we use the absolute value of the abnormal discretionary accrual profits (*DA*) to measure the degree of accrual earnings management. Model (7) is as follows:

$$TAC_{it}/A_{i(t-1)} = \partial_0/A_{i(t-1)} + \partial_1(\Delta S_{it} - \Delta AR_{it})/A_{i(t-1)} + \partial_2(FA_{it}/A_{i(t-1)}) + \xi_{it} \quad (7)$$

TAC_{it} represents the total accrual profits of firm *i* in period *t* by deducting the net profits of the current period from the net operating cash flow. *A_{i(t-1)}* represents the total assets of firm *i* in period *t* - 1, ΔS_{it} indicates the change in sales revenue in period *t* of firm *i*, ΔAR_{it} represents the change in accounts receivable in period *t* of firm *i*, *FA_{it}* represents the original value of the fixed assets of firm *i* in period *t*, and ξ_{it} is the random error.

With model (7), cross-section regression is used to estimate the current uncontrollable accrual profits, and the residual is obtained, which is called the accrual earnings management. The absolute accrual earnings management (*DA*) is used to measure the degree of accrual earnings management. We run the OLS regression with model (5) and (6). The results of the regression are shown in Table V. The results show a significant negative correlation between environmental information disclosures and accrual earnings

Dep. DA	(1)	(2)
<i>EID</i>	-0.004*** (-3.02)	-0.001 (-0.33)
<i>Change</i>		0.025*** (5.97)
<i>EID* Change</i>		-0.006** (-2.26)
<i>Size</i>	-0.004*** (-3.39)	-0.004*** (-3.31)
<i>LEV</i>	0.036*** (5.33)	0.036*** (5.40)
<i>ROA</i>	-0.031 (-1.59)	-0.034* (-1.72)
<i>IC</i>	-0.007*** (-4.90)	-0.007*** (-4.94)
<i>INT₀₋₁</i>	-0.009* (-1.85)	-0.008* (-1.79)
Constant	0.176*** (7.16)	0.171*** (6.96)
Year	YES	YES
Industry	YES	YES
Adj. <i>R</i> ²	0.161	0.162
<i>N</i>	4263	4263

Table V.
Impact of
environmental
disclosures on
earnings
management

Notes: *, ** and *** represent significance at the 10, 5 and 1% levels, respectively

management at the 1 per cent significant level (-0.004 , $t = -3.02$), which indicates that when firms disclose higher levels of environmental information, the financial earnings management is relatively reduced. The coefficient of $EID*Change$ is -0.006 at the 5 per cent significant level ($t = -2.26$), which shows that the behavior of earnings management is reduced to a greater extent after compared with before the issuance of *Measure*. The results confirm that earnings management is one way that the disclosure of environmental information affects the possibility of issuing non-standard audit opinions and the collection of audit fees.

4.4.4 Robustness tests

4.4.4.1 The impact of different kinds of environmental disclosures on audit opinions (fees). To further examine the impact of environmental information disclosures on audit opinions (fees), following Clarkson *et al.* (2008), we divide the environmental information into two categories: soft environmental information (EID_soft) and hard environmental information (EID_hard). In the annual report and social responsibility report, soft information includes three categories: vision and strategy, environmental measures and public welfare activities related to the environment. Hard information includes environmental management systems, the reliability and credibility of environmental information, expenditures on environmental technology and investments, resource consumption and pollution controls, important environmental problems and types of influence, and the improvement of environmental performance. EID_soft and EID_hard are similarly available according to EID measurement methods (Yao and Li, 2018a, 2018b).

To test the impact of different kinds of environmental information on audit opinions (fees), we run model (1)-(4) with EID_hard and EID_soft instead of EID . The regression results are shown in Table VI. The results show a significant negative correlation between hard environmental information disclosure and audit fees at the 1 per cent level and a significant negative correlation with the presentation of non-standard audit opinions at the 5 per cent level. Considering the influence of *Measure*, the coefficient of $EID_hard_{-1} * Change$ is -0.001 at the 5 per cent significant level, revealing a more negative effect on audit fees and non-standard audit opinions after compared with before the issuance of *Measure*. However, there is no significant negative correlation between soft environmental information disclosure and the possibility of non-standard audit opinions or audit fees. The regression results show that auditors are selective in the use of environmental information. Compared with the vague abstraction of soft information, hard information is easier to examine and verify, so it is more useful for the presentation of audit opinions or audit fees.

4.4.4.2 The impact of different kinds of environmental disclosures on earnings management. To further verify the functional route of the impact of environmental disclosures on non-standard audit opinions and audit fees, we run model (5) and (6) with EID_hard and EID_soft instead of EID .

The regression results are shown in Table VII. There is a significant negative correlation between EID_hard and earnings management at the 1 per cent level, and the negative effect is more pronounced after the issuance of *Measure*. However, the relationship between EID_soft and earnings management is not significant. The results show that the negative impact of “hard disclosure” of environmental information on earnings management is more significant than “soft disclosure” of environmental information. Thus, the higher the level of “hard disclosure” of environmental information, the lower is the level of earnings management.

4.4.4.3 The effect of measure and EID on audit opinions and audit fees considering the endogeneity. Our sample covers only the listed companies in the manufacturing industry and has no control sample, which may represent the endogenous problem. To check the

Table VI.
Influence of “hard
(soft) disclosure” of
environmental
information on audit
opinions and audit
fees

Dep.	Fee				Opinion			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
<i>EID_hard₋₁</i>	-0.013*** (-4.87)	-0.013 (-1.09)	-0.001 (-0.08)	-0.011 (-0.61)	-0.003** (-2.20)	-0.002 (-0.93)	-0.342 (-1.06)	-0.060 (-0.25)
<i>EID_soft₋₁</i>				0.011 (0.43)				-1.303*** (-3.67)
<i>Change</i>		-0.030** (-1.98)				-0.045*** (-4.83)		
<i>EID_hard₋₁* Change</i>		-0.001** (-2.02)				-0.001** (-2.17)		
<i>EID_soft₋₁* Change</i>				-0.017 (-0.77)				-0.474 (-1.48)
Control	YES	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES	YES	YES	YES
Adj. R ² / Pseudo R ²	0.535	0.535	0.532	0.532	0.398	0.397	0.436	0.437
N	2470	2470	2470	2470	2375	2375	2375	2375

Notes: *, ** and *** represent significance at the 10, 5 and 1% levels, respectively

Dep. DA	(1)	(2)	(3)	(4)	Environmental disclosure
<i>EID_hard</i>	-0.001*** (-3.39)	-0.001 (-0.54)			
<i>EID_soft</i>			-0.001 (-0.63)	0.002 (0.75)	
<i>Change</i>		-0.023*** (5.90)		0.020*** (5.40)	
<i>EID_hard* Change</i>		-0.002** (-1.97)			
<i>EID_soft* Change</i>				-0.004 (-1.28)	
<i>Size</i>	-0.004*** (-3.34)	-0.004*** (-3.28)	-0.004*** (-3.78)	-0.004*** (-3.76)	
<i>LEV</i>	0.036*** (5.36)	0.036*** (5.43)	0.035*** (5.23)	0.035*** (5.22)	
<i>ROA</i>	-0.033* (-1.69)	-0.036* (-1.80)	-0.030 (-1.56)	-0.032 (-1.63)	
<i>IC</i>	-0.007*** (-4.94)	-0.007*** (-4.99)	-0.007*** (-4.87)	-0.007*** (-4.85)	
<i>INT₀₋₁</i>	-0.009* (-1.84)	-0.008* (-1.78)	-0.009* (-1.91)	-0.009* (-1.89)	
<i>Year</i>	YES	YES	YES	YES	
<i>Industry</i>	YES	YES	YES	YES	
<i>Adj. R²</i>	0.162	0.163	0.160	0.160	
<i>N</i>	4263	4263	4263	4263	

Notes: *, ** and *** represent significance at the 10, 5 and 1% levels, respectively

Table VII.
Influences of different kinds of environmental disclosures on earnings management

impact of endogeneity, we establish differences-in-differences models and define three control samples to perform robust tests. Model (8) and (9) are established as follows:

$$Fee/Opinion = \beta_1 Treatment + \beta_2 Change + \beta_3 Treatment*Change + Controls + \xi \tag{8}$$

$$Fee/Opinion = \beta_1 Treatment + \beta_2 Change + \beta_3 Treatment*Change + \beta_4 EID_{-1} + \beta_5 Treatment*EID_{-1} + \beta_6 Change*EID_{-1} + \beta_7 Treatment*Change*EID_{-1} + Controls + \xi \tag{9}$$

In model (8) and (9), *Treatment* represents the treatment group, including the listed companies in the manufacturing industry or in heavily polluting industries, or the listed companies that disclosed no environmental information before *Measure* but disclosed environmental information after *Measure*. In model (8), β_3 represents the change in *Fee* and *Opinion* in the treatment group after the issuance of *Measure*. In model (9), β_7 represents the change in *Fee* and *Opinion* in the treatment group considering the level of environmental disclosure after the issuance of *Measure*.

First, we define the listed companies in the manufacturing industry as the treatment group, and we select the firms from other industries except the financial industries as the control group following the principle of the same year and similar scale. The final sample comprises 6918 firm-year observations. We run the model (8)-(9), and the results are shown in Panel A of [Table VIII](#). The results indicate that, after the issuance of *Measure*, firms in manufacturing industries have a greater reduction of the possibility of non-standard audit opinions or audit fees than firms in other industries. In addition, more environmental information is disclosed by firms in manufacturing industries, and the possibility of non-standard audit opinions or audit fees are reduced after the issuance of *Measure*.

Second, we define firms in the heavily polluting industry as the treatment group and select the control group following the principle of the same year and similar scale as the treatment

Dep.	Fee	Fee	Opinion	Opinion
<i>Panel A: Treatment group is firms in the manufacturing industry</i>				
<i>Treatment</i>	-0.122 (-0.28)	0.137 (0.87)	0.044 (0.23)	-0.540 (-0.64)
<i>Change</i>	-0.052** (-2.07)	-0.140*** (-8.17)	-0.036*** (-3.20)	-1.120*** (-2.95)
<i>Treatment* Change</i>	-0.048** (-2.12)	-0.010 (-0.60)	-0.113** (-2.04)	-0.141 (-0.38)
<i>EID₋₁</i>		-0.009** (-2.00)		0.089 (1.24)
<i>EID₋₁* Treatment</i>		0.007 (1.38)		-0.113 (-1.32)
<i>EID₋₁* Change</i>		0.010** (2.11)		-0.170* (-1.71)
<i>Treatment* Change* EID₋₁</i>		-0.007** (-1.98)		-0.134** (-2.16)
Controls	YES	YES	YES	YES
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
Adj. R ² / Pseudo R ²	0.586	0.584	0.332	0.324
N	6918	6918	6918	6918
<i>Panel B: Treatment group is firms in the heavily polluting industry</i>				
<i>Treatment</i>	-0.056 (-0.51)	-0.059 (-0.54)	-0.032 (-0.69)	-1.061 (-1.35)
<i>Change</i>	-0.030 (-1.29)	-0.033 (-1.33)	-0.036*** (-3.37)	-1.222*** (-3.17)
<i>Treatment* Change</i>	-0.041* (-1.78)	-0.038 (-1.27)	-0.062** (-2.13)	-0.037 (-1.09)
<i>EID₋₁</i>		-0.017** (-2.20)		-0.034 (-0.43)
<i>EID₋₁* Treatment</i>		0.007 (0.78)		-0.156 (-1.37)
<i>EID₋₁* Change</i>		0.002 (0.26)		-0.029 (-0.32)
<i>Treatment* Change* EID₋₁</i>		-0.003** (-2.26)		-0.110*** (-2.84)
Controls	YES	YES	YES	YES
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
Adj. R ² / Pseudo R ²	0.588	0.589	0.402	0.401
N	6382	6382	6382	6382
<i>Panel C: Treatment group is firms that disclosed no environmental information before Measure but disclosed environmental information after Measure</i>				
<i>Treatment</i>	-0.001 (-1.27)	-0.001 (-0.14)	0.070 (0.19)	0.161 (0.43)
<i>Change</i>	-0.016 (-1.37)	-0.007 (-0.27)	-0.892*** (-2.88)	-0.596* (-1.65)
<i>Treatment* Change</i>	-0.008*** (-4.20)	0.046 (0.85)	-0.449** (-2.18)	-0.945 (-0.95)
<i>EID₋₁</i>		-0.027** (-5.11)		-0.077 (-1.47)
<i>EID₋₁* Treatment</i>		0.024 (1.45)		-0.017 (-0.14)
<i>EID₋₁* Change</i>		0.018*** (2.95)		-0.117* (-1.65)
<i>Treatment* Change* EID₋₁</i>		-0.038* (-1.76)		-0.223** (-2.05)
Controls	YES	YES	YES	YES
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
Adj. R ² / Pseudo R ²	0.520	0.521	0.392	0.395
N	3066	3066	3066	3066
Notes: *, ** and *** represent significance at the 10, 5 and 1% levels, respectively				

Table VIII.
Effects of measure and EID on audit opinions and audit fees considering endogeneity

group. We run the model (8)-(9), and the results are shown in Panel B of Table VIII. The results indicate that, after the issuance of *Measure*, firms in the heavily polluting industry experience a greater reduction in the possibility of non-standard audit opinions or audit fees than firms in other industries, and more environmental information is disclosed by firms in the heavily polluting industry. The possibility of non-standard audit opinions or audit fees is reduced after the issuance of *Measure*. It is well known that *Measure* strengthens regulations on environmental disclosure of heavily polluting industries, and our results confirm the audit effects of polluting firms' environmental disclosure.

Third, we define firms that disclosed no environmental information before *Measure* but disclosed environmental information after *Measure* as the treatment group, and select the firms that voluntarily disclose environmental information before *Measure* as the control group. We expect that the treatment group has a more significant audit effect than the control group. We run the model (8)-(9), and the results are shown in Panel C of Table VIII. The results indicate that, after the issuance of *Measure*, firms that disclosed no environmental information before *Measure* but disclosed environmental information after *Measure* experience a greater reduction in the possibility of non-standard audit opinions or audit fees than firms that voluntarily disclose environmental information before *Measure*. Additionally, more environmental information is disclosed by firms that disclosed no environmental information before *Measure* but disclosed environmental information after *Measure*, supporting the possibility of a reduction of non-standard audit opinions or fees after *Measure*. The results suggest that *Measure* has an obvious audit effect, and the endogenous problem has no impact on our conclusions.

4.4.4.4 Regression analysis based on change models. To test the relationship between environmental information disclosure and audit fees, we use change models to perform a robust regression. The regression results are shown in Table IX. After controlling for the other variables, ΔEID , ΔEID_hard and ΔFee are significantly negatively correlated at the 1 per cent level. However, ΔEID_soft has no significant relationship with ΔFee . The results confirm that *Measure* and the increase in environmental information have a significant negative effect on audit fees.

4.4.4.5 Regression analysis with the latest data. To check the robustness of the results, we extend the sample time from 2012 to 2017 and compare the results for 2009-2011 and 2012-2017. The results are shown in Table X. After the promulgation of *Measure*, from 2009

Dep. ΔFee	(1)	(2)	(3)
ΔEID	-0.095*** (-13.94)		
ΔEID_hard		-0.093*** (-42.94)	
ΔEID_soft			-0.002 (-0.37)
Controls	YES	YES	YES
Year	YES	YES	YES
Industry	YES	YES	YES
Adj. R^2	0.114	0.519	0.016
N	1786	1786	1786

Table IX.
Regression analysis
based on change
models

Notes: *, ** and *** represent significance at the 10, 5 and 1% levels, respectively

Dep.	2009-2011		2012-2017	
	Fee	Opinion	Fee	Opinion
EID_{-1}	-0.009*** (-2.90)	-0.084** (-2.03)	-0.016*** (-5.60)	-0.094*** (-2.86)
Controls	YES	YES	YES	YES
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
Adj. R^2 / Pseudo R^2	0.532	0.487	0.649	0.538
N	1499	1499	9481	9481

Table X.
Influence of
environmental
disclosures on audit
opinions and audit
fees from 2009 to
2017

Notes: *, ** and *** represent significance at the 10, 5 and 1% levels, respectively

to 2011, environmental information disclosures are negatively correlated with the issuance of non-standard audit opinions and the collection of audit fees at the 1 per cent and 5 per cent significance level, respectively. From 2012 to 2017, environmental information disclosures are more negatively correlated with the issuance of non-standard audit opinions and the collection of audit fees at the 1 per cent significance level than during 2009-2011. The research results show that the audit effect is increasingly pronounced with time.

5. Conclusions and suggestions

We consider the promulgation of *Measure* as the research background to study the audit effects of environmental information disclosures. The results show that:

- the level of environmental information disclosure is negatively correlated with non-standard audit opinions and audit fees, and the relation is more pronounced after the issuance of *Measure*;
- environmental disclosures of firms in heavily polluting industries, and firms with low media attention or a high level of internal control have a more significant negative impact on non-standard audit opinions (fees) than other firms;
- compared with soft environmental information, hard environmental information has a more obvious influence on audit opinions (fees); and
- environmental disclosure influences the possibility of issuing non-standard audit opinions and audit fees by reducing the firms' earning management.

According to our results, full use should be made of the positive audit effects of environmental disclosure:

- Governments should improve laws and regulations on the incentives and penalties related to environmental information disclosures and should encourage firms to improve their level of environmental information disclosure. In the future, firms should be required to compulsively disclose environmental information in a step-by-step manner, especially the hard environmental information.
- Managers need to consider non-financial information, paying particular attention to hard environmental information, especially for firms in heavy polluting industries, and firms with low media attention or a high level of internal control.
- Auditors should pay more attention to environmental information and treat it differently.

When media attention is high, more attention should be paid to the reliability of environmental information. If the internal control is high, the reference value of non-financial information is larger. In addition, information effectiveness can reflect industry differences. For different industries, we should consider the content difference of non-financial information.

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Appendix

Each firm can gain a score for evaluating its level of corporate *EID* based on equation (11):

$$EID_i = \sum_{j=1}^n SCID_{ij} \tag{11}$$

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where EID_i is the total score of *EID* for the firm i , and $SCID_i$ is the score of the j th component for firm i , in which $j = 1, 2, \dots, 10$.

Similarly, the level of corporate *EID_Soft* and *EID_Hard* can be evaluated based on equation (12) and equation (13):

$$EID_Soft_i = \sum_j SCID_{ij} \quad (j = 4, 5, 9) \tag{12}$$

$$EID_Hard_i = \sum_j SCID_{ij} \quad (j = 1, 2, 3, 6.7, 8, 10) \tag{13}$$

Table AI.
Components for
measuring corporate
EID and its
categories

Item	Definition	Category
<i>SCID</i> ₁	Firm's environmental investment expenditure for technology development	Hard information
<i>SCID</i> ₂	Government appropriate funds, finance allowance and tax abatement related to the environment	Hard information
<i>SCID</i> ₃	Disposal and treatment of generated waste, recycling and integrated utilization of waste products	Hard information
<i>SCID</i> ₄	Information related to ISO environmental system authentication	Soft information
<i>SCID</i> ₅	Construction and operation of environmental improvement	Soft information
<i>SCID</i> ₆	Influence of government environmental protection policy	Hard information
<i>SCID</i> ₇	Loans related to environmental protection	Hard information
<i>SCID</i> ₈	Lawsuit, atonement, penalty, and bounty related to environmental protection	Hard information
<i>SCID</i> ₉	Firm's environmental protection policies, strategies and goals	Soft information
<i>SCID</i> ₁₀	Other environmentally related information	Hard information

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