

Article

The Impact of Environmental Administrative Penalties on the Disclosure of Environmental Information

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Abstract: Stakeholders often have a significant interest in the disclosure of information by companies that have received environmental penalties. This study examines how environmental administrative penalties influence companies' environmental disclosures. Using a sample of 316 manufacturing companies across three years in China, the regression results indicate that the level of voluntary environmental information disclosure (EID) is significantly positively affected by environmental penalties. For companies in heavily polluting industries, environmental penalties decrease their involuntary EID. Environmental penalties also reduce the quality of environmental information, which is mainly reflected in the weakening of the integrity, comprehensibility, and relevance of environmental information in corporate social responsibility (CSR) reports or environmental reports. These findings help us to understand the sustainability of corporate environmental responsibility in the context of environmental administrative penalties.

Keywords: environmental administrative penalty; environmental information disclosure; quality of the environmental information; qualitative characteristics of environmental information

1. Introduction

Environmental administrative penalties directly affect companies' revenues by disrupting their production process, but they also generate negative externalities. Companies that are subject to environmental penalties are ultimately responsible for the punishment, and have to bear the related costs. As profit-seeking entities, most organizations would be expected to react by undertaking strategies to reduce the negative effects that may flow from unexpected penalties [1].

Previous research suggests that environmental disclosures in annual reports can be integrated as an environmental strategy or used as a self-serving tool to alleviate the crisis of legitimacy to gain legitimacy from stakeholders [2–4]. Based on the theory of legitimacy, some researchers found that companies will increase environmental disclosures under the circumstances of being prosecuted by the Environmental Protection Agency [5], being subject to regulatory fines [6], or facing environmental crises or accidents [7–9]. Managers can also rely on impression management strategies to obfuscate the company's actual performance and pursue their interests [10–13]. The researchers argued that if managers want to conceal negative aspects of the company, they will obfuscate negative outcomes by increasing reading difficulty in their annual reports [10,14,15] or providing less complete information, and so on [16]. Then, under the environmental administrative penalty, how might environmental information disclosure (EID) be affected? The extant literature does not provide an answer. Revealing the effect of the environmental administrative penalty on environmental disclosure is the key to understanding the disclosure strategy of penalized companies.

In China, the Ministry of Environmental Protection encourages listed companies to disclose environmental information. However, companies in heavily polluting industries are required to disclose some specific environmental information according to relevant policies. Hence, mandatory EID is only a disclosure requirement for heavily polluting industries. Environmental events such as environmental penalties may affect voluntary EID or mandatory EID, but few studies have incorporated the voluntary disclosure and mandatory disclosure together to address the effects of environmental penalties on EID.

Content analysis is a general method to measure EID [17–20], but the method does not take into account the characteristics of information quality in measuring the quality of environmental information disclosure [21]. Among the quality characteristics of environmental information (relevance, reliability, comprehensibility, comparability, balance, and integrality), which aspects of characteristics are affected by the environmental penalty? The extant literature also does not provide an answer.

To fill these research gaps and help stakeholders understand the corporate EID under the environmental administrative penalty, the objective of the research is to reveal how environmental penalties affect the level and quality of EID. We seek to answer the question of how environmental penalties affect EID from the aspects of voluntary disclosure, mandatory disclosure, and quality characteristics of environmental information. We combine legitimacy theory with impression management theory to explain the environmental information disclosure of penalized companies, and try to examine the impact of environmental penalties on EID from two aspects of level and quality to find out which aspects of quality characteristics of environmental information have been affected by environmental penalties.

This structure of the article is as follows. The following section presents the theoretical background and hypotheses development, followed by research design and methods. The subsequent section presents the empirical results. The final section summarizes the main findings of the study with a discussion of its practical implications.

2. Theoretical Background and Hypotheses Development

2.1. Legitimacy Management and EID

Suchman (1995) introduced the concept of corporate legitimacy. He defined legitimacy as a generalized perception or assumption in which the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions [22]. Legitimizing is concerned with building, maintaining, and repairing the relationship or contract [22]. If a company fails to close the legitimacy “gap”, its legitimacy will be withdrawn by some stakeholders, so the company has to manage these stakeholders to close a legitimacy “gap” [23].

To fill the gap in the context of legitimacy, the researcher argued that companies could respond to perceived legitimacy threats through four actions [24]. First, they can inform the “relevant public” of changes in the behavior of the organization. Second, they can attempt to change the perception of the “relevant public”, but then not change the behavior of the organization. Third, they can manipulate public perception by diverting public attention. Fourth, they can seek to adjust societal expectations.

Environmental information disclosure could be used as a legitimacy tool to narrow the legitimacy “gap” between how the organization wishes to be perceived and how it actually is perceived [2,3,7]. A company that has lost some legitimacy because of a single misdemeanor may try to recover it through information disclosure [25]. For example, Deegan and Rankin (1996) found that companies tend to increase disclosures to address a threat to their legitimacy under the circumstances of being prosecuted [5]. Warsame et al. (2002) found that companies subject to governmental fines would like to provide more organized, specific, and verifiable information regarding company environmental activities [6].

However, based on Chinese listed companies, Meng et al. (2014) found that although poor environmental performers increase disclosure after being exposed as environmental violators,

they avoid negative environmental disclosures [26]. Taking the Carbon Disclosure Project in China from 2008 to 2012 as a sample, Li et al. (2018) examined the impact of environmental legitimacy on corporate carbon disclosure, and found that environmental legitimacy influences the likelihood of corporate carbon disclosure [27]. Although these scholars have explained the company's environmental information disclosure from the point of view of legitimacy management, there is still a lack of research on how legitimacy management affects environmental information disclosure in the context of environmental punishment.

2.2. *Impression Management and EID*

In the social psychology field, the process of impression management usually consists of two stages. One is to form the motivation of impression management, and the other is to construct an impression [28]. These two stages are called impression motivation and impression construction, respectively. Impression motivation refers to the willingness of individuals to manipulate and control their images. Impression construction entails "choosing the kind of impression to create" and "deciding how to do it" [28] (pp. 35,36).

Scholars extended the research of impression management from the field of social psychology to enterprise. Elsbach et al. (1998) considered that impression management was designed and implemented to influence the audience's impression of the organization [29]. Corporate annual report documents are often used by managers to proactively shape stakeholders' perceptions of organizational outcomes and events [12,30,31].

Impression construction may take the form of presenting an inaccurate view of organizational outcomes or an accurate, but favorable view of organizational outcomes [28,31]. Previous studies have shown that the main tools of impression management contain "self-interest attribution" and "manipulation of the readability" [31,32]. The tendency of self-interest attribution can be divided into two types: selective biases and self-presentational biases [32]. "Selective biases" is a tendency that managers selectively report matters that affect corporate performance and deliberately exaggerate or conceal certain information. "Self-presentational biases" is a tendency in which managers prefer to introduce unrelated factors to analyze the causes of its performance. Managers also manipulate the readability of reports for impression management. If managers want to cover up the negative news, they will obfuscate negative outcomes by increasing the reading difficulty of their annual reports [10,14,15].

Merkel-Davies and Brennan (2007) categorized impression management strategies into two types: attribution and concealment [10]. Attribution manifests itself by claiming positive outcomes to managerial ability and attributing negative organizational outcomes to external factors [33–35]. Concealment can be achieved either by emphasizing positive organizational achievements or obfuscating negative outcomes.

Based on the theoretical framework of impression management, many researchers found that impression management affects the information disclosure of companies. For example, Merkel-Davies and Brennan (2007) argued that managers manipulate primarily either the disclosure (quantity, thematic content, and attribution) or the presentation (verbal tone and language) of the information presented [10]. Cho et al. (2012) found that the information provided in sustainability reports can be manipulated by companies to obtain and reinforce a positive image and conceal negative aspects [36]. Melloni et al. (2017) found that the companies with the worst financial and social performance provide less accurate integrated reports and incomplete information on their corporate social responsibility (CSR) performance [16]. Martínez-Ferrero et al. (2019) considered that impression construction can be obtained either by emphasizing positive performance or by concealing adverse outcomes in CSR reports [13]. The above research indicates that impression management may affect the quality of EID. However, among the qualitative characteristics of relevance, reliability, comprehensibility, comparability, balance, and integrality, which aspects of characteristics are affected by the impression management? The extant literature does not provide an answer.

While these studies have shed some light on the relationship between impression management and EID, as well as that between legitimacy management and EID, there are few studies based on impression management theory and legitimacy management theory to explain how environmental penalties affect EID. This article is one of the few empirical studies in emerging markets, which can provide a reference for China and other developing countries to draft relevant EID regulations.

2.3. Environmental Administrative Penalty and the Voluntary EID

The researchers found that companies respond to threats to legitimacy through the expanded use of CSR disclosure [5,6]. Milne and Patten (2002), through the use of an “experimental decision case”, illustrated that positive disclosures could sometimes serve to restore or repair a corporation’s legitimacy [37]. Cho (2009) found that companies tend to increase the quantity of annual report environmental disclosures during the environmental disaster period, and he argued that an incremental need for legitimization strategies appears to exist when a company faces crises [7]. De Villiers and van Staden (2011) found that organizations react to perceived legitimacy threats through increased safety disclosures in the annual reports, sustainability reports, etc. [8].

In China, the voluntary environmental information stipulated in regulations mostly refers to positive environmental information. Since a firm’s environmental disclosure influences depict how other stakeholders perceive its legitimacy [38], company managers subject to environmental penalties may perceive that the legitimacy of the company in a threat. To narrow the legitimacy “gap” and alleviate the crisis of legitimacy, they are motivated to increase positive environmental disclosures and demonstrate the company’s efforts in environmental protection. Hence, we propose the following hypothesis:

Hypothesis 1 (H1). *There is a positive correlation between the environmental administrative penalty and the level of voluntary EID.*

2.4. Environmental Administrative Penalty and the Mandatory EID

This paper analyzes the relationship between mandatory environmental disclosures and environmental administrative penalty using an impression management theory framework. Managers have a greater incentive to strengthen impression management when the financial or CSR performance is bad [16,36,39–41]. The environmental penalty damages the reputation of the company, and the managers have the motivation to alter users’ perceptions of corporate achievements to avoid the economic losses caused by the possible escalation of the crisis.

Salancik and Meindl (1984) found that companies have the tendency of self-interest attribution in the process of impression management [32]. The tendency of self-interest attribution includes “selective biases” and “self-presentational biases”. The tendency of self-interest attribution of penalized enterprises in disclosing environmental information is mainly reflected in the “selective biases”. That is, after being penalized, managers would reduce the level of information disclosure and hide some negative or sensitive information to avoid the escalation of the crisis.

The researchers found that impression management strategies can be based on concealment, by both employing thematic content manipulation or including more positive than negative words as well as convoluted terms [42,43]. Therefore, by manipulating the amount of information provided on positive and negative aspects, they can direct attention to good news and distract attention from undesirable and negative information [44].

The “Guidelines for environmental information disclosure of listed companies” issued by the Ministry of Environmental Protection of China requires companies in the heavily polluting industry to disclose environmental information regularly. The mandatory environmental information stipulated in the guide includes mostly negative and sensitive environmental information, such as the occurrence of major environmental problems, the disposal of industrial solid wastes and hazardous wastes according to law, and other information. We argue that increased disclosures of negative and sensitive

information cannot help to maintain or reclaim image. On the contrary, under administrative penalty, disclosing some negative or sensitive information that is inconsistent with the facts can increase the risk of the investigation by the China Securities Regulatory Commission and local environmental protection department, which may lead to an escalation of the crisis. For penalized companies in heavily polluting industries, inadequate disclosure regulation makes them less likely to be punished by regulators, even if they do not disclose some sensitive or negative environmental information.

The analysis of impression management also can be carried out within an economics-based framework where managers act as rational utility-maximizing individuals [31]. We consider that cost/benefit trade-offs and impression management are not contradictory in explaining the behavior surrounding the mandatory disclosure of the penalized company in the context of the existing regulations in China. Weighing the costs and benefits may be the reason why the company tends to adopt defensive disclosure strategies to manage its impression. The mandatory disclosure of environmental information was constrained by cost–benefit factors. For market regulators, the cost of required disclosure mainly includes the operating expenses of regulators, and the consumption of social resources caused by the process of dealing with the violation. So, the rational choice of the regulatory agency to regulate the disclosure of environmental information is the appropriate control. In China, the supervision of corporate environmental disclosure is not strong enough, and the probability of surveillance is relatively low. Facing the economic risk of exposure of sensitive and negative information, the rational choice for the penalized company is to reduce the level of those sensitive and negative disclosures in terms of not disclosing detailed and quantitative information or even hiding them. Since the disclosure of mandatory environmental information mainly includes negative and sensitive environmental information, we propose the following hypothesis:

Hypothesis 2 (H2). *For companies in heavily polluting industries, there is a negative correlation between the environmental administrative penalty and mandatory EID.*

2.5. Impression Management and the Quality of EID in the Context of Environmental Administrative Penalty

Many studies have found that managers have a greater incentive to obfuscate information when the CSR or financial performance is bad [13,16,39–41]. In this paper, we argue that the environmental penalty strengthens the impression management of the company. On the one hand, when the image of a company is threatened by administrative penalty, managers need to use ex-post impression management to maintain the image that may be damaged by an environmental penalty (maintain image motivation). On the other hand, impression management entails the management opportunistically taking advantage of information asymmetries [13]. Managers know very well the real environmental situation of the company. Under the asymmetric information, managers tend to obfuscate negative organizational outcomes or provide misleading information in the annual environmental report and to weaken the harm of events toward the image of the company [13,16,31]. Therefore, impression management avoids reputation losses to a certain extent, and indirectly evolves into the real economic interests of companies and managers. From the above two aspects, we consider that the environmental penalty will promote the impression management of companies.

The management can use the discretion inherent in environmental information disclosed by means of manipulating the presentation and disclosure of information to “distort readers’ perceptions of corporate achievements” [45]. For penalized companies, the main means of impression management include “self-interest attributions” and “manipulation readability”. Managers of penalized companies have the tendency of “selective biases” in information disclosure; for instance, they would like to deliberately exaggerate some information or hide negative and sensitive information, which damages the integrity and reliability of environmental information in the CSR report or environmental report. In addition, managers have the self-presentational biases, as managers tend to add irrelevant information or factors to the environmental report to explain the outcomes. The manipulated environmental information in the report does not help the information users predict the future performance of the

enterprise or understand the past and present situation of the enterprise, which reduces the relevance of environmental information.

Environmental reports and CSR reports prepared by managers should be understood by most information users. When the managers of the penalized company try to obfuscate negative outcomes, they will adopt the strategy of manipulation readability [10,16]. Specifically, this strategy increases the reading difficulty through complex text narrative to affect the readers' understanding, which makes it difficult for stakeholders to identify the actual environmental performance of the company.

According to the above analysis, because the environmental penalty will promote the impression management of companies, and the impression management will reduce the quality of the environmental information disclosed by the company, we propose the following hypothesis:

Hypothesis 3 (H3). *The environmental administrative penalty is negatively related to the quality of environmental information disclosed by companies.*

3. Research Methods and Data Sources

3.1. Samples and Data Sources

The companies investigated for this study are all manufacturing firms in the Stock "A" markets at the Shanghai and Shenzhen Stock Exchanges in China. The manufacturing sector was chosen because manufacturing produces more pollution than other industries, and faces more responsibility concerning environmental protection [46,47]. The environmental information for each company was obtained from the following sources: (1) Independent CSR or environmental reports, and (2) bulletins related to the environment. The reports and bulletins were obtained from the website of the Shanghai and Shenzhen stock exchanges, and another site recommended by the China Securities Regulatory Commission. That website provides links for all Chinese companies listed on the exchanges, and presents the full operational information. Environmental penalty data were from the database of the Institute of Public and Environmental Affairs (IPE). We collected financial data from the database of China Stock Market and Accounting Research (CSMAR).

From 2014 to 2016, out of 706 listed companies, 334 manufacturing listed companies disclosed environmental information. We excluded the 18 listed companies that lack explanatory variables and got 316 samples after the elimination. The final study sample included data from 316 companies from 2014 to 2016 (948 firm-year observations). The sample screening results are shown in Table 1.

Table 1. Sample screening table.

Sample	Number
The number of listed companies that disclosed environmental information in 2014	706
The number of manufacturing companies that disclosed environmental information uninterrupted from 2014 to 2016 (losing 372 companies)	334
The number of samples of missing explanatory variables (losing 18 companies)	18
Final sample number	316

We identify the type of industry based on the "List of Classified Management of Environmental Protection Verification Industry of Listed Companies" issued by the Ministry of Environmental Protection. The sample consists of 316 manufacturing companies, of which 147 are in heavily polluting industries such as metallic and non-metallic minerals, petroleum, chemicals and plastics, textiles, clothing, and fur. There are 169 manufacturing companies in non-heavily polluting industries, and these companies operate in the following industries: mechanical equipment, machinery, and instrumentation; electronic manufacturing companies; food and drink.

3.2. Selection and Measurement of Variables

3.2.1. Measurement of EID Level

The level of EID (EIDL) is gauged based on the content and degree of environmental disclosure [48]. Scholars generally use the index method of content analysis to measure the disclosure of corporate environmental information [4,26,49,50]. Environmental disclosure regulations differ between different countries [46,51]. In China, the Environmental Disclosure Rules were issued by the China State Environmental Protection Administration (SEPA) in 2007, requiring listed companies to disclose whether they caused pollution and to report the measures implemented or to be deployed to protect the environment. According to the SEPA rules, we developed indicators for content analysis with a set of seven components, to evaluate the level of corporate EID based on the Chinese context. These components include environmental values, policies, and organization; environmental management systems and initiatives; environmental technology, environmental investment and expenditure; resource consumption and environmental performance; environmental protection public welfare activities; pollution control and environmental compliance; and significant environmental impacts, events, and risk management.

An “indexing” technique was used to quantify the level of EID [50]. Each item was scored according to its disclosure level, ranging between 0 and 3. The described question with monetary and quantitative terms has a score of 3, and scores of 2 for specific description, 1 for general items, and 0 for no information [47,49,50]. The scores of different measurement items are added to obtain the environmental disclosure index for each company. There are six team members involved in the coding of content analysis. Table 2 lists the measurement items of environmental information.

3.2.2. Measurement of Environmental Information Quality

Based on a questionnaire survey of social responsibility information users, Ane (2012) developed an indicator system to measure the quality of environmental information disclosure (EIDQ) from four aspects, including relevance, reliability, comparability, and clarity [52]. Leitonienė and Sapkauskienė (2015) measured the quality of social information from two aspects of relevance and reliability [53]. Ji et al. (2013) measured CSR information from the information quality characteristics, i.e., relevance, reliability, comprehensibility, comparability, balance, and integrality [21]. This study draws on the quality characteristics items of environmental information developed by Ji et al. (2013), but to distinguish the relative importance of these items, we invite experts to rate the importance of each item.

We asked 62 experts, including 10 professors engaged in CSR research, 12 CSR report editors, and 15 from CSR reporting appraisal agencies, eight from media organizations, and 17 securities analysts. We select these experts because they were equipped with high-quality CSR information to evaluate the company’s CSR performance. The selection of experts from media organizations is due to the involvement of some media organizations in the assessment of social responsibility reports, and they have jointly launched various ratings and awards with professional evaluation agencies. So, they have a deeper understanding of the quality of environmental information [54,55]. We choose securities analysts because they are essential users of environmental information, and they usually need to refer to the environmental information disclosed by the listed company to improve the accuracy of earnings forecasts [38,56].

The respondent can rank items from 1 to 5 points (a. Very important—5 points; b. Important—4 points; c. General importance—3 points; d. Not important—2 points; e. Very unimportant—1 point). Next, we tested the reliability and validity of the questionnaire. The overall Cronbach’s alpha factor of the questionnaire was 0.8559, and the Cronbach’s alpha coefficient for each quality feature was more than 0.7 acceptable levels, indicating the high reliability of the questionnaire. The results of Kaiser-Meyer-Olkin (KMO) and Bartlett tests in Table 3 indicate that a factor analysis is appropriate (Kaiser, 1974) (KMO = 0.794; Bartlett: p -value = 0.00). Principal components analysis is used to obtain the factor with an eigenvalue greater than 1, and the retained factors have loadings greater than

0.5. Finally, we got six quality characteristic factors and 12 quality characteristic items. The internal relationship and common meaning of 12 measurement items are summarized, and they are renamed as six quality characteristics.

Table 2. Measurement items of environmental information.

Category	Items
Environmental values, policies, and organization	1. The values of operator's environment 2. Environmental protection policies and objectives 3. Environmental protection organization structure and personnel responsibility
Environmental management system and initiative	1. International Organization for Standardization Certification and other environmental certification 2. Voluntary cleaner production 3. Environmental education and training 4. Plant greening and working environment improvement 5. Environmental information exchange with stakeholders 6. The implementation of environmental accounting 7. Participate in government environmental protection projects 8. Environmental honor 9. Third-party environmental audit
Environmental technology, environmental investment, and expenditure	1. Research and development of environmental technology 2. Waste treatment and technology development 3. Construction and operation of environmental protection facilities 4. Environmental loans or investments 5. Environmental-related government grants and subsidies, etc. 6. Environmental recurrent expenditure
Resource consumption and Environmental performance	1. Total resource consumption 2. Total pollution discharge 3. Resource consumption per unit of raw materials, water resources consumption, energy consumption, etc. 4. Wastewater per unit of raw materials, emissions of major pollutants, greenhouse gas emissions, etc. 5. Environmental benefits such as revenue from the wastes, etc. 6. Social benefits of reducing emissions
Environmental protection public welfare activities	1. Environmental-related social activities 2. Potential environmental impacts such as global warming 3. Other environmental activities
Pollution control and environmental compliance	1. Discharge of pollution up to standard 2. Completion of total emission reduction tasks 3. Implementation of the "three simultaneous" systems 4. Status of sewage charges 5. General industrial solid waste and hazardous waste disposal according to law 6. Applications for discharge permit 7. Noise condition 8. Environmental impact assessment
Significant environmental impacts, events, and risk management	1. Environmental violation and environmental contamination in accident 2. The establishment and operation of the environmental risk management system 3. Construction projects with significant environmental impact 4. Whether or not to be included in the list of serious pollution enterprises 5. Major risk sources of company 6. Resident complaint 7. The impact of environmental laws and regulations on the operation of the company 8. The complete situation of an emergency plan for environmental emergencies

Table 3. KMO and Bartlett's test.

Kaiser–Meyer–Olkin Measure of Sampling Adequacy		0.749
Bartlett's Test of Sphericity	Approx. chi-square	509.933
	df	66
	Sig.	0.000

The weight was defined as the ratio of the average value of a quality characteristic item to the average value of all the quality characteristic items. This process yields the environmental information quality characteristic system with weights, as shown in Table 4. After determining the weight of the 12 quality characteristic items, a company's environmental information quality index was obtained by adding up the scores of the different items.

$$EIDQ_T = \sum_{i=1}^{12} \omega_i \times I_i \quad (1)$$

In this expression, ω_i represents the weight, I_i represents the score of each measurement item, and $EIDQ_T$ represents the sum of the score.

Table 4. Quality characteristic items associated with environmental information.

Characteristics	%	Evaluation Items
Relevance	8.6	I1: Item reflects the past performance of the enterprise in the field of environmental protection. (No disclosure: assigned 0; simple text: assigned 1; detailed text description: assigned 2; data quantification: assigned 3)
	7.5	I2: Item contains information about the company's plans for environmental protection. (No disclosure: assigned 0; simple text: assigned 1; detailed text description: assigned 2; data quantification: assigned 3)
Reliability	8.9	I3: Whether the report has been examined by a third-party professional body. (If no disclosure: assigned 0; it is examined by an expert in a certain field of social responsibility: assigned 1; it is a well-known domestic audit institution: assigned 2; the audit body is a major international accounting firm or an internationally renowned social responsibility reporting organization: assigned 3.)
	8.7	I4: Authenticity and accuracy of environmental information disclosed. (In the social responsibility report, if there is no proof of the degree of inspection and no commitment: assigned 0; an audit by the principal: assigned 1; the company promises that the information disclosed in the report is true and accurate: assigned 2; the "The degree of examination specified in the inspection statement" is a total or deep audit: assigned 3.)
Comprehensibility	7.5	I5: Information disclosure is presented in a quantitative form and is clear and easy to read. (No quantitative information: assigned 0; a small amount of quantitative information: assigned 1; a large quantity of quantitative information: assigned 2; quantitative information displayed in tables or histograms: assigned 3.)
	7.8	I6: Qualitative environmental information is intuitive, visual, and easy to understand. (There are no pictures, cases, and news reports in real time, no term interpretation: assigned 0; only a small number of pictures, cases, or factual news reports, terms interpretation: assigned 1; some information has pictures, cases, or news reports, the term interpretation: assigned 2; a large number of pictures, cases, or factual news reports; the term interpretation: assigned 3.)
Comparability	7.7	I7: Compliance with uniform reporting criteria. (If the uniform reporting specification is not followed: assigned 0; the reporting standard is "Company Act" or "Measures on the publicity of Environmental Information in Enterprises and Institutions": assigned 1; if it refers to one of the criteria from the "Guidelines on social responsibility of listed companies", "Guidelines on environmental information disclosure of listed companies", "Guidelines on the compilation of enterprise environmental reports" and "Guidelines on environmental information disclosure of listed companies": assigned 2; the company's environment report that cites two or more criteria: assigned 3.)
Balance	9.6	I8: Description, reasons, and countermeasures for the occurrence of substantive negative information on environmental protection during the reporting period. (In detail, it refers to the disclosure of information about adverse environmental events, as well as measures to rectify existing loopholes in environmental protection. If no disclosure: assigned 0; simple text disclosure: assigned 1; detailed text description: assigned 2; data quantification: assigned 3.)
	7.3	I9: There is no bias toward a stakeholder: This part of the environmental information refers to substantive environmental issues where companies actively responded to the concerns of investors, creditors, the public, the employee government, etc. (If reference is made in the report to a substantive environmental issue of concern to a particular stakeholder: assigned 1; a simple textual description of a substantive topic of concern to multiple stakeholders: assigned 2; it uses data, pictures, or tabular details to describe substantive issues of concern to multiple stakeholders: assigned 3.)

Table 4. Cont.

Characteristics	%	Evaluation Items
Integrity	8.5	I10: No information reflecting significant environmental impacts is omitted. (In the environmental report, if the board of directors and all directors of the company guarantee that there is no material omission in the report: assigned 3; if no disclosure: assigned 0.)
	9.3	I11: Covers all major environmental events during the reporting period and their impact on future projections. (In detail, it refers to the disclosure of the impact of energy conservation, emission reduction, and major environmental impact projects on enterprise development. If no disclosure: assigned 0; simple text: assigned 1; detailed text description: assigned 2; data quantification: assigned 3.)
	8.6	I12: Information on the environment is included for all entities controlled or affected by the company during the reporting period. (In detail, it refers to whether the environmental report includes the environmental information of the headquarters of the group and its subordinate units. If no disclosure: assigned 0; simple text: assigned 1; detailed text description: assigned 2; data quantification: assigned 3.)

3.2.3. Measurement of Explanatory Variables and Control Variables

We define the explanatory variable as the environmental administrative penalty (*Penalty*), which is a virtual variable. The companies with a value of 1 represent the penalization, and a value of 0 shows no penalization. Environmental violations are segregated into three types: excessive emission of pollutants (*EE*), environmental pollution incidents (*EPI*), and construction projects against the environmental law (*CPAEL*).

To prevent the results from being driven by firm heterogeneity, additional independent variables were also adopted as control variables to describe company characteristics [47,51,57]. These control variables include the size of the company (*Size*), leverage (*Lev*), ownership (*Soe*), audited (*Audit*), return on equity (*Roe*), pollution industry (*Pollu*), revenue growth (*Growth*), media coverage (*Media*), shareholding ratio of the top five major shareholders (*Herf5*), and year fixed effect (*Year*).

A firm's size and revenue growth might have an impact on environmental disclosures. Manufacturing enterprises with substantial assets and considerable revenue growth, producing more products and pollutants, are more likely to disclose more environmental information. In this study, *Size* was measured by the natural logarithm of total assets year-end as a proxy variable [51], and the revenue growth was incorporated as a proxy variable and measured with the increased rate of business revenue. The rate of return on common stockholders' equity (*ROE*) is used to measure the economic performance of enterprises [47,58], and we set *ROE* as a control variable.

The degree of pollution and external regulation differ among industries, and the industry type is the critical factor affecting environmental disclosure. The study divided companies into heavily polluting and the others. This classification is taken from the "List of Classified Management of Environmental Protection Verification Industry of Listed Companies" issued by the Ministry of Environmental Protection. A dummy variable is coded 1 when the company belongs to a heavily polluting industry, and 0 otherwise.

The asset–liability ratio reflects the financial risk and resource redundancy of the company. Cormier, Magnan, and Van Velthoven (2005) found a negative correlation between the high asset–liability ratio and corporate environmental information disclosure [59]. So, we add *Lev* (leverage) as a control variable.

Under China's current national economic system, state-owned companies are easy to receive more attention and support from the government in terms of environmental protection, so whether they belong to state-owned companies will affect the environmental information disclosure [60]. A dummy variable is coded 1 when the company is state-owned, and 0 otherwise.

Kim et al. (2012) found that since CSR disclosure is less regulated and constrained, management selectively discloses CSR information for self-interest reasons, or symbolically uses a CSR report to "green" itself without actually taking real action [61,62]. The report is audited, which means restrictions

on the behavior of manipulating the disclosure of environmental information. A dummy variable coded 1 when the report is audited, and 0 otherwise.

Scholars found that environmental disclosure is positively associated with environmental media coverage [56,59,63,64]. Media coverage is measured by the number of articles on news websites concerning environmental issues. Following the researcher, a keyword search is performed using the Baidu News search engine [65]. The keywords pertain to environmental information and include “environment”, “environmental protection”, “low carbon”, “pollution”, and “environmental destruction”. The search results include the total number of media reports about the company over that particular year, and we use the number of media reports as a proxy variable for media coverage.

The dominant shareholders typically have access to the information they need. Considering the trade-off of cost/benefit, the environmental information that is publicly disclosed is unlikely to be resolved toward more disclosure. The previous research found that ownership concentration is negatively associated with environmental information disclosure [59]. Therefore, we select the sum of squares (Herfi5) of the shareholding ratio of the top five major shareholders as the control variable.

3.3. Metrological Model

In this study, differential treatment for pre and post-levels of EID between two accounting years was used to examine the impact of the environmental penalty on the change in levels of EID and environmental information quality, comparing to those firms with no environmental penalty. This study also examined whether penalty types significantly affect the change of the level of voluntary EID, mandatory EID ($\Delta VEIDL$, $\Delta MEIDL$,) and quality of EID ($\Delta EIDQ$).

As this research utilized the balance panel data of two periods, the residuals of the same company may correlate in different years, and the residuals among different companies in the same year may also be associated. As such, it is necessary to estimate the standard error in the application of a panel data set. In addressing the correlation of error terms and bias of ordinary least squares (OLS) and Eicker–Huber–White robust standard error, we used the approach developed by Petersen’s (2009) for correlating across firms and across time [66]. It provided the firm-year two-way unbiased cluster-robust standard errors adjustment.

4. Empirical Results and Analyses

4.1. Descriptive Results and Variable Correlations

Table 5 reports the descriptive statistics and Pearson’s correlation coefficients. The $\Delta VEIDL$ and $\Delta MEIDL$ distribution are almost symmetrical with the mean of 0.099, 0.012, indicating that the overall level of environmental information disclosure has not changed much in the adjacent years. The average value of $\Delta EIDQ$ is -0.001 , which indicates that the change of environmental information quality in adjacent years is also very small. We notice that on average, companies in our sample set are profitable (mean $ROE = 0.068$; mean $Growth = 0.124$). None of the absolute values of the correlations exceeded 0.5, which indicates there was no multicollinearity between variables.

Table 5. Descriptive statistics and correlation coefficients.

Variable	Min	Max	Mean	S.D.	Penalty	Δ VEIDL	Δ MEIDL	Δ EIDQ	Growth	Lev	Roe	Size	Soe	Pollu	Audit	Safty	Media	Herfi5
Penalty	0.000	1.000	0.068	0.252	1													
Δ VEIDL	−7.910	11.01	0.099	1.829	0.240 **	1												
Δ MEIDL	−6.020	14.01	0.012	1.112	−0.016 *	0.236 **	1											
Δ EIDQ	−0.742	0.466	−0.001	0.170	−0.302 **	0.005	0.035	1										
Growth	−1.725	5.970	0.124	0.615	0.101 *	0.283 **	0.078 *	0.041	1									
Lev	0.031	1.345	0.450	0.204	−0.084 *	−0.086 *	−0.018	−0.075	0.016	1								
Roe	−2.141	3.499	0.068	0.241	0.244 **	0.098 *	0.041	0.087 *	0.049	−0.167 **	1							
Size	0.777	8.684	4.529	1.361	0.199 **	0.224 **	0.068	−0.054	0.012	0.386 **	0.114 **	1						
Soe	0.000	1.000	0.212	0.409	−0.017	0.071	−0.006	0.012	0.073	0.044	−0.04	0.017	1					
Pollu	0.000	1.000	0.467	0.499	0.226 **	−0.038	−0.043	−0.124 **	−0.074	0.019	−0.029	0.024	−0.051	1				
Audit	0.000	1.000	0.149	0.356	−0.042	−0.030	0.050	0.067	−0.037	0.06	0.057	0.252 **	−0.065	−0.017	1			
Safty	0.000	1.000	0.820	0.385	−0.037	−0.008	−0.052	−0.028	−0.113 **	0.039	−0.05	0.054	0.082 *	0.043	0.080 *	1		
Media	0.000	13.00	3.502	2.143	0.213 **	0.373 **	0.195 **	0.003 *	0.187 **	0.062	0.096 *	0.191 **	0.041	−0.025	0.058	−0.003	1	
Herfi5	0.000	0.681	0.139	0.126	0.029	−0.018	0.018	−0.033	−0.064	0.139 **	0.008	0.222 **	0.135 **	0.047	0.093 *	0.072	0.005	1

Notes: * Significance at the 10% level. ** Significance at the 5% level. *** Significance at the 1% level.

4.2. Regression Results between the Environmental Administrative Penalty and EID

Table 6 reports the regression results. In regression 1, we tested the association between the environmental penalty and the level of voluntary EID. Regression (1) provides a positive coefficient of *Penalty* (0.559, $p < 0.01$), suggesting that the penalty has a positive impact on the level of voluntary EID. The finding is supportive of hypothesis 1's prediction that there is a positive correlation between the environmental administrative penalty and the level of voluntary EID.

In regression 2, we tested the association between the environmental penalty and the level of mandatory EID. As is shown, there is a negative coefficient of *Penalty* (−1.68, $p < 0.05$), suggesting that the environmental penalty negatively influenced the level of mandatory EID. The finding is supportive of hypothesis 2's prediction that there is a negative correlation between the environmental administrative penalty and mandatory EID for companies in heavily polluting industries.

In regression 3, we tested the association between the environmental penalty and the quality of EID. The regression (3) provides a negative correlation between *Penalty* (−0.81, $p < 0.01$) and $\Delta EIDQ$ and between *Pollu* (heavily polluting firms) and $\Delta EIDQ$. So, the environmental administrative penalty is negatively related to the quality of environmental information disclosed by companies, which validates hypothesis 3. The result shows that environmental penalties reduce the quality of environmental information.

Table 6. The relationship between environmental penalty and $\Delta EIDL$, $\Delta EIDQ$.

	Regression (1) $\Delta VEIDL$	Regression (2) $\Delta MEIDL$	Regression (3) $\Delta EIDQ$
<i>Penalty</i>	0.559 *** (3.75)	−1.680 ** (−1.99)	−0.810 *** (−6.37)
<i>Growth</i>	0.438 *** (5.64)	0.02 (0.21)	0.002 ** (1.97)
<i>Lev</i>	−0.127 (−0.80)	−0.259 (−0.93)	−0.039 (−1.10)
<i>Roe</i>	0.021 (0.01)	0.104 (0.56)	0.140 (1.55)
<i>Size</i>	0.110 *** (2.74)	0.015 (0.32)	−0.01 (−1.06)
<i>Soe</i>	0.153 (1.34)	−0.066 (−0.46)	−0.01 (−0.03)
<i>Pollu</i>	−0.094 (−0.98)		−0.022 * (−1.75)
<i>Audit</i>	−0.087 * (−1.65)	0.06 ** (1.97)	0.028 *** (4.48)
<i>Media</i>	0.586 *** (25.83)	0.10 *** (3.37)	0.040 * (1.66)
<i>Herfi 5</i>	−0.545 * (−1.73)	−0.079 (−0.17)	−0.055 (−1.05)
<i>Cons</i>	−2.043 *** (−10.71)	−0.263 *** (−3.20)	−0.032 (−1.23)
<i>Year</i>	YES	YES	YES
<i>N</i>	632	294	632
Adj-R2	0.602	0.191	0.214
F-stat	68.06 ***	15.70 ***	18.37 ***

Note: Petersen t statistics are based on standard errors double clustered by year and firm to control for cross-sectional and time-series correlation. The significant levels are based on Petersen t statistics. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.3. Further Test

4.3.1. One-Way ANOVA: A Post-Hoc Test for Comparing These Effects

The administrative environmental penalty can be classified as the pollution discharge exceeding the standard (*EE*), the environmental pollution event (*EPI*), and construction projects against the environmental law (*CPAEL*). To test whether there are significant differences in the impact of different types of administrative penalty on the level of voluntary EID, the quality of EID, we use one-way ANOVA to compare these effects. First, we conducted the test of homogeneity of variances. The p -values were 0.166 and 0.757, respectively, both of which were greater than 0.05. It means that the assumption of homogeneity of variance holds. Next, we conducted a post-hoc test comparing these effects. As shown in Tables 7 and 8, all the p -values are greater than 0.1, indicating that there are no significant differences in the impact of different types of environmental penalty on the level of voluntary EID and the quality of EID.

Table 7. Multiple comparisons of LSD method. EE: excessive emission of pollutants, EPI: environmental pollution incidents, and CPAEL: construction projects against the environmental law.

Variable: $\Delta VEIDL$				
(I) Types	(J) Types	Mean Difference (I-J)	Std. Error	Sig.
EE	EPI	−0.302	0.279	0.287
	CPAEL	0.066	0.247	0.792
EPI	EE	0.302	0.279	0.287
	CPAEL	0.368	0.304	0.234
CPAEL	EE	−0.066	0.248	0.792
	EPI	−0.368	0.304	0.234

Table 8. Multiple comparisons of LSD method.

Variable: $\Delta EIDQ$				
(I) Types	(J) Types	Mean Difference (I-J)	Std. Error	Sig.
EE	EPI	−0.039	0.092	0.672
	CPAEL	−0.054	0.082	0.509
EPI	EE	0.039	0.092	0.672
	CPAEL	−0.015	0.100	0.881
CPAEL	EE	0.054	0.082	0.509
	EPI	0.015	0.100	0.881

4.3.2. Independent Sample T-Test for Distinguishing the Change of Information Quality Feature

The regression results show a negative correlation between environmental administrative penalty and $\Delta EIDQ$. The characteristics of environmental information quality include the relevance, reliability, comprehensibility, comparability, balance, and integrality. This study used the independent sample t-tests to determine which characteristics are significantly different under environmental penalties.

As shown in Table 9, there is a difference in the mean value of $\Delta EIDQ$ between the penalized companies and the non-penalized companies. Table 10 shows the result of an independent samples test. We have performed the independent sample t-test in two parts: the first step was to conduct the Levene's test for an equality of variances. The second step was a t-test for an equality of means. In sample 1, the average scores of $\Delta EIDQ$ (relevance, comprehensibility, balance, and integrality) of the penalized companies were significantly lower than those of the non-penalized companies. In sample 2, the average scores of $\Delta EIDQ$ (relevance, comprehensibility, and integrality) of the penalized companies were also significantly lower than those of the non-penalized companies.

Table 9. Group statistics.

		Sample 1 (Year: 2015)		Sample 2 (Year: 2016)	
Characteristics	Type	N	Mean	N	Mean
Relevance	Penalized company	16	−0.019	27	−0.017
	Non-penalized company	300	0.002	289	0.018
Reliability	Penalized company	16	0.000	27	0.001
	Non-penalized company	300	−0.001	289	0.002
Comprehensibility	Penalized company	16	−0.052	27	−0.003
	Non-penalized company	300	0.012	289	0.001
Comparability	Penalized company	16	0.024	27	0.000
	Non-penalized company	300	0.016	289	0.000
Balance	Penalized company	16	−0.127	27	−0.045
	Non-penalized company	300	0.032	289	−0.065
Integrity	Penalized company	16	−0.258	27	−0.052
	Non-penalized company	300	−0.001	289	0.019

An independent sample t-tests (Table 10) suggests that the adverse effect of the environmental penalty on the quality of environmental information is mainly reflected in the weakening of the integrity, comprehensibility, and relevance of environmental information in CSR reports or environmental reports. Regarding the integrity of information quality, penalized companies are prone to omit information reflecting significant environmental impacts, and omit major environmental events during the reporting period. They also tend to omit environmental information from all entities controlled or affected by companies during the reporting period. Regarding the relevance of information quality, penalized companies do not truly reflect their past and future performance and specific planning in environmental protection. Concerning the comprehensibility of information quality, qualitative environmental information disclosed by penalized companies is not intuitive and hard to understand, which means that managers manipulate the reading ease to deceive or mislead shareholders through complex textual disclosures.

Table 10. Independent samples test.

		Sample 1				Sample 2			
		Levene's Test		T-Test		Levene's Test		T-Test	
		F	Sig.	t	Sig.	F	Sig.	t	Sig.
Relevance	Equal variances assumed	1.279	0.259	−1.991	0.047	0.050	0.823	−2.589	0.010
	Equal variances not assumed			−2.413	0.027			−2.809	0.008
Reliability	Equal variances assumed	2.319	0.129	0.168	0.867	1.357	0.245	−0.430	0.667
	Equal variances not assumed			0.111	0.913			−1.409	0.160
Comprehensibility	Equal variances assumed	94.31	0.000	4.558	0.000	1.042	0.308	3.531	0.006
	Equal variances not assumed			1.964	0.064			2.502	0.020
Comparability	Equal variances assumed	0.984	0.322	0.700	0.485	0.375	0.541	−0.305	0.760
	Equal variances not assumed			0.645	0.528			−1.000	0.318
Balance	Equal variances assumed	0.464	0.496	−4.472	0.000	0.279	0.598	0.744	0.457
	Equal variances not assumed			−5.917	0.000			0.756	0.456
Integrity	Equal variances assumed	491.4	0.000	−19.59	0.000	0.003	0.953	−3.315	0.001
	Equal variances not assumed			−4.700	0.000			−4.075	0.000

4.4. Robustness Test

4.4.1. Environmental Information Disclosure and the Environmental Penalty: Based on the Propensity Score Matching Method

The endogenous problem may be caused by the non-randomness of sample selection or the bidirectional causality between the independent variable and the dependent variable. In this study, if the companies subject to environmental penalty have inherent differences in EIDL and EIDQ, the endogenous problems will arise. To eliminate this concern and increase the robustness of the conclusions, we use the propensity score matching method to compare the EID of companies that have been penalized with a matched sample of firms that have not been penalized, assuming that such selection occurs on observable company characteristics.

Referring to prior literature [67], we use a probit model to estimate the probability of being penalized using the full sample. Then, we calculate the propensity score for each company based on the above regression, and match each penalized company to a non-penalized company having the nearest neighbor score. To increase the matching quality, we continue to impose a caliper distance (caliper = 0.01) as a sensitivity analysis to restrict the maximum allowable distance between the propensity scores for each matched pair.

$$\text{Prob(Penalty)} = \beta_0 \text{Lev} + \beta_1 \text{Size} + \beta_2 \text{Soe} + \beta_3 \text{Audit} + \beta_4 \text{Safty} + \beta_5 \text{Pollu} + \beta_6 \sum \text{YEAR} + \varepsilon \quad (2)$$

The *penalty* is a dummy variable that is coded 1 if the company is penalized in a given year, and 0 otherwise. We also select a set of firm-specific variables as predictors based on prior

research [47,51,59,68], including firm size (*Size*), leverage (*Lev*), audit (*Audit*), ownership (*Soe*), and safety production license to be allowed by the supervision department (*Safty*), type of industry (*Pollu*), and year (*Year*) fixed effects.

Columns (1) and (4) of Table 11 show the regression results of Model (1). As is shown, the pseudo R2 values are 0.284 and 0.161, respectively, suggesting an acceptable explanatory power. Columns (2), (3), (5), and (6) of Table 11 and columns (7) and (8) of Table 12 tabulate results using the propensity score matched sample. Columns (2), (5), and (7) are based on nearest-neighbor matching, and Columns (3), (6), and (8) further imposed a caliper distance (caliper = 0.01). Column (2) shows that the coefficients on *Penalty* are still positive and significant in both cases. For companies in heavily polluting industries, the coefficients on *Penalty* in Columns (5) and (6) are also significantly negative. Table 12 reports the relationship between *Penalty* and the $\Delta EIDQ$, the coefficients on *Penalty* are still significantly negative.

Corroborating with our earlier evidence, the results presented in Tables 11 and 12 indicate that regardless of whether penalized companies are benchmarked with a matched control sample, environmental penalties are positively associated with $\Delta VEIDL$ and negatively associated with $\Delta MEIDL$ and $\Delta EIDQ$. This shows that the conclusions of this study are robust.

Table 11. Environmental administrative penalty and $\Delta VEID$, $\Delta MEID$: propensity score matching.

	Probit Model	Nearest Neighbor	Nearest Neighbor (caliper = 0.01)	Probit Model	Nearest Neighbor	Nearest Neighbor (caliper = 0.01)
	(1)	(2)	(3)	(4)	(5)	(6)
	<i>PENALTY</i>	$\Delta VEIDL$	$\Delta VEIDL$	<i>PENALTY</i>	$\Delta MEIDL$	$\Delta MEIDL$
<i>Penalty</i>		1.427 *** (5.02)	1.452 *** (4.67)		−0.435 ** (−2.17)	−0.325 ** (−2.25)
<i>Lev</i>	−4.121 *** (−4.26)	−1.148 *** (−2.74)	−0.714 (−1.54)	−3.148 *** (−3.26)	−0.403 (−1.31)	−0.407 (−1.38)
<i>Size</i>	1.015 *** (6.13)	0.323 *** (3.80)	0.479 *** (5.08)	0.895 *** (5.14)	0.064 (0.99)	0.114 * (1.76)
<i>Soe</i>	0.042 (0.09)	0.021 (0.09)	0.017 (0.08)	0.338 (0.71)	−0.702 *** (−4.54)	−0.650 *** (−4.65)
<i>Audit</i>	−1.096 * (−1.78)	−0.522 * (−1.89)	−0.732 ** (−2.48)	−0.588 (−0.94)	0.216 (1.26)	0.002 (0.01)
<i>Safty</i>	−0.766 * (−1.76)			−0.863 * (−1.84)		
<i>Pollu</i>	2.422 *** (4.75)	−0.423 (−1.46)	−0.018 (−0.06)			
<i>Growth</i>		0.005 (0.07)	0.021 (0.21)		0.023 (0.49)	0.011 (0.34)
<i>Roe</i>		0.632 (1.14)	0.714 (1.18)		−3.112 *** (−7.19)	−2.506 *** (−6.27)
<i>Media</i>		0.403 *** (8.37)	0.420 *** (8.19)		0.240 *** (7.00)	0.212 *** (6.05)
<i>Herfi 5</i>		−1.952 ** (−2.44)	−2.135 ** (−2.54)		−0.944 (−1.64)	−0.452 (−0.85)
<i>Cons</i>	−6.889 *** (−7.15)	−2.605 *** (−4.16)	−3.675 *** (−5.47)	−4.271 *** (−4.98)	0.443 (1.09)	0.509 (1.34)
YEAR	YES	YES	YES	YES	YES	YES
N	632	152	138	294	120	104
F-stat		21.08 ***	21.20 ***		9.317 ***	8.421 ***
Adj-R2		0.594	0.649		0.461	0.475
Pseudo R2	0.284			0.161		

Note: * Significance at the 10% level. ** Significance at the 5% level. *** Significance at the 1% level.

Table 12. Environmental administrative penalty and $\Delta EIDQ$: propensity score matching.

	Probit Model	Nearest Neighbor	Nearest Neighbor (caliper = 0.01)
	(1)	(7)	(8)
	<i>PENALTY</i>	$\Delta EIDQ$	$\Delta EIDQ$
<i>Penalty</i>		−0.279 *** (−5.04)	−0.311 *** (−5.17)
<i>Lev</i>	−4.121 *** (−4.26)	−0.004 (−0.04)	−0.029 (−0.33)
<i>Size</i>	1.015 *** (6.13)	−0.058 *** (−3.53)	−0.058 *** (−3.22)
<i>Soe</i>	0.042 (0.09)	−0.022 (−0.53)	−0.040 (−0.98)
<i>Audit</i>	−1.096 * (−1.78)	0.036 (0.67)	0.025 (0.44)
<i>Safty</i>	−0.766 * (−1.76)		
<i>Pollu</i>	2.422 *** (4.75)	−0.109* (−1.93)	−0.068 (−1.11)
<i>Growth</i>		0.014 (0.94)	0.012 (0.59)
<i>Roe</i>		0.114 (1.06)	0.049 (0.43)
<i>Media</i>		0.057 *** (6.06)	0.061 *** (6.02)
<i>Herfi 5</i>		−0.462 *** (−2.97)	−0.387 ** (−2.37)
<i>Cons</i>	−6.889 *** (−7.15)	0.239* (1.96)	0.208 (1.60)
<i>YEAR</i>	YES	YES	YES
<i>N</i>	632	152	138
<i>F-stat</i>		9.523 ***	9.030 ***
<i>Adj- R2</i>		0.428	0.440
<i>Pseudo R2</i>	0.284		

Note: * Significance at the 10% level. ** Significance at the 5% level. *** Significance at the 1% level.

4.4.2. Different Types of Environmental Administrative Penalty and Environmental Information Disclosure

Next, we test whether the relationship between environmental penalty and EID varies with the type of penalty. According to the type of environmental penalty, we set up three explanatory variables *EE*, *EPI*, and *CPAEL*, and set $\Delta VEIDL$, $\Delta MEIDL$, and $\Delta EIDQ$ to the explained variable. The test results are shown in Table 13.

Table 13. The relationship between different types of environmental penalty and $\Delta EIDL$, $\Delta EIDQ$.

	Regression	Regression	Regression
	(1) $\Delta VEIDL$	(2) $\Delta MEIDL$	(3) $\Delta EIDQ$
<i>EE</i>	0.572 ** (2.08)	−0.200 * (−1.73)	−0.206 *** (−4.39)
<i>EPI</i>	0.364 * (1.81)	−0.071 ** (−1.97)	−0.172 *** (−3.08)
<i>CPAEL</i>	0.666 ** (1.98)	−0.245 (−1.57)	−0.147 *** (−3.17)
<i>Growth</i>	0.438 *** (5.63)	0.024 (0.24)	0.001 (1.13)
<i>Lev</i>	−0.115 (−0.75)	−0.244 (−0.87)	−0.036 (−1.03)
<i>Roe</i>	0.010 (0.01)	0.102 (0.56)	0.151 (0.55)
<i>Size</i>	0.113 *** (2.76)	0.012 (0.25)	−0.095 (−0.64)
<i>Soe</i>	0.154 (1.34)	−0.074 (−0.51)	−0.001 (−0.95)
<i>Pollu</i>	−0.096 (−1.00)		−0.022* (−1.73)
<i>Audit</i>	−0.088 * (−1.65)	0.060 * (1.73)	0.027 * (1.86)
<i>Media</i>	0.586 *** (25.79)	0.100 *** (3.36)	0.004 *** (4.33)
<i>Herfi 5</i>	−0.539 * (−1.72)	−0.053 (−0.12)	−0.052 (−0.99)
<i>Year</i>	YES	YES	YES
<i>Cons</i>	−2.046 *** (−10.69)	−0.990 *** (−2.61)	−0.621 (−1.15)
<i>N</i>	632	294	632
<i>Adj-R2</i>	0.602	0.172	0.197
<i>F-stat</i>	64.35 ***	13.79 ***	15.11 ***

Note: * Significance at the 10% level. ** Significance at the 5% level. *** Significance at the 1% level.

In Table 13, Regression (1) shows the effect of different types of environmental penalties on voluntary EID ($\Delta VEIDL$). *EE*, *EPI*, and *CPAEL* have a significant impact on the $\Delta VEIDL$ with coefficients of 0.572, 0.364, and 0.666, respectively. These results show that those types of environmental penalty have a positive impact on the level of voluntary EID. The *EE*, *EPI*, and *CPAEL* coefficients of Regressions (2) and (3) are all negative, which shows that the environmental penalty has a negative impact on the level of mandatory EID and the quality of environmental information. The above regression results show that there is no significant change in our research conclusions, and the results have robustness.

In a word, in this chapter, we carry out descriptive statistics, correlation analysis, regression analysis, further tests, and a robustness test. Based on the metrological model, we validate the three proposed hypotheses. Next, based on the one-way ANOVA method, we find that there are no significant differences in the impact of different types of environmental penalty on the level of voluntary EID or the quality of EID. We use an independent sample t-test for distinguishing the change of the information quality feature, and find that the environmental penalty reduces the quality of the environmental information, which is mainly reflected in the weakening of the integrity, comprehensibility, and relevance of environmental information. Finally, based on the propensity score matching method and grouping regression of the samples, we find that the research conclusions are robust. We use a flow chart to describe the methods that are used, and their main results are presented in this paper. The flow chart is shown in Figure 1.

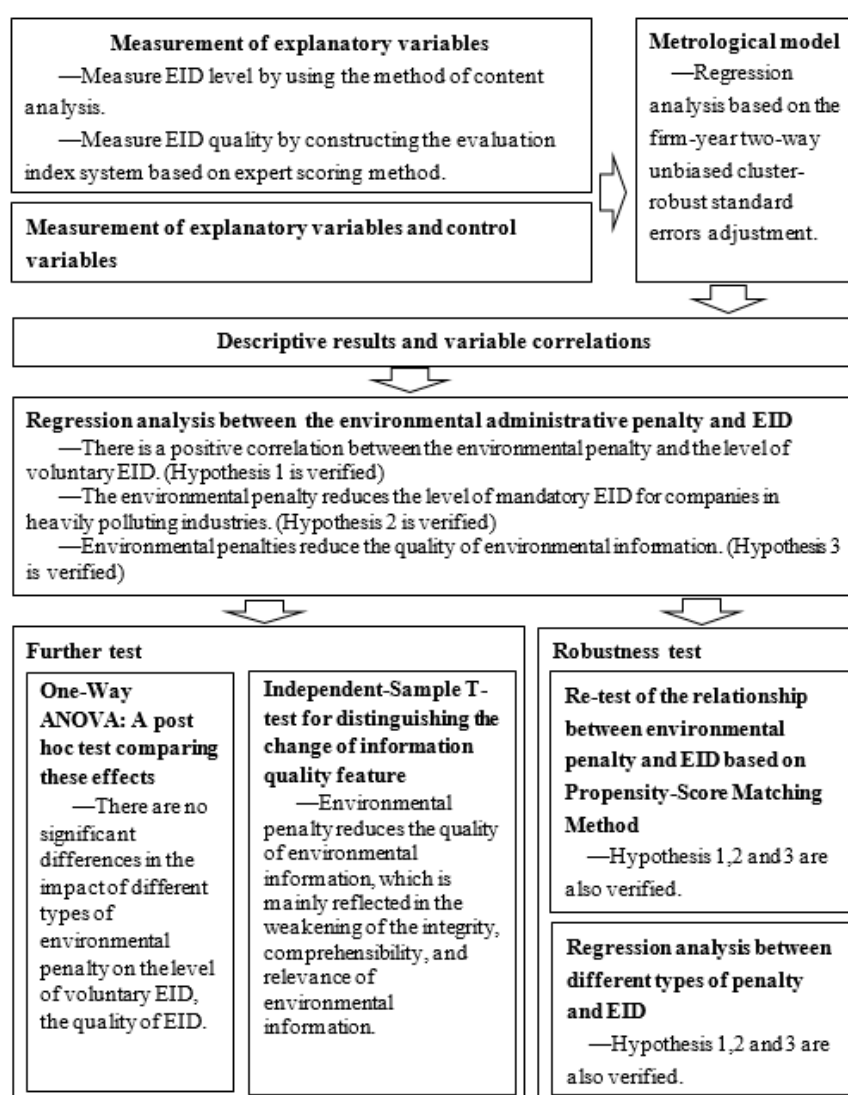


Figure 1. The statistical methods and the results.

5. Discussion and Conclusion

5.1. Discussion

Does the environmental administrative penalty affect the disclosure of the company's environmental information? The findings of this research suggested that the answer to the question is yes. In this study, we argue that the EID of the penalized company is used not only for managing legitimacy, but also for managing impression. We further argue that the consequence of legitimacy management and impression management affect the level and quality of EID. By developing this framework and empirically testing its predictions, we obtain three main insights.

First, our study offers evidence that environmental administrative penalties make the management of the company increase the level of voluntary EID. The results are consistent with the findings of three related articles. First, Deegan and Rankin (1996) found that in the absence of environmental disclosure regulations, even if companies have been prosecuted for environmental misdemeanors, managers still report predominantly favorable environmental information [5]. Second, Warsame, Neu, and Simmons (2012) considered how a discrediting event such as an environmental fine influences the environmental disclosures in subsequent annual reports. They found that companies subject to governmental fines provided more organized, specific, and verifiable information regarding their environmental activities, and management is trying to respond positively to a demonstrated public concern [6]. Meng et al. (2014) examined the relationship between corporate environmental performance and environmental disclosure. They found that after the environmental violation was exposed by the Ministry of Environmental Protection, companies would increase their environmental information disclosure [26]. The above results are consistent with the findings of this study. The main theories are consistent with ours. They argue that there is a need for these companies to narrow the legitimacy "gap" and the legitimating endeavor taking the form of increased disclosure of positive, or "good" environmental news.

Second, our study offers evidence that environmental penalties make the penalized company decrease its mandatory EID. We argue that companies in heavily polluting industries are unwilling to disclose mandatory environmental information to the public. Although the government pressure has an impact on corporate EID to a certain extent [58], defects of laws and lighter penalties may leave room for companies in heavily polluting industries to disclose information selectively. Such selective disclosure may be reflected in a reduction in the level of those sensitive and negative disclosures in terms of not disclosing detailed and quantitative information or even hiding them. Further, our results confirm the findings of prior study in which the researcher identified a negative correlation between environmental violation and negative/sensitive environmental information disclosure [26].

Third, our study offers evidence that the environmental penalty can reduce the quality of EID, which is mainly reflected in the weakening of the integrity, comprehensibility, and relevance of environmental information in CSR reports or environmental reports. Our findings are similar to the findings of Martínez-Ferrero et al. Based on the framework of impression management theory, the researchers found that companies with the worst CSR performance disclose information that is less clear, accurate, and balanced; moreover, these reports incorporate longer and less readable information [13]. The extant literature indicates that negative outcomes, such as environmental penalties or worst CSR performance, may enhance the company's impression management, and will lead to a decline in the quality of EID.

5.2. Implications

These findings of this research have several practical implications for investors, government policymakers, and other stakeholders. We argue that stakeholders should have a rational view of the environmental information disclosed by the penalized company. The penalized companies may not have provided a valuable, credible environmental information report. The penalized companies will increase voluntary disclosures to imitate companies with better environmental performance,

which may mislead investors' cognition of corporate environmental performance. In addition, the penalized companies may hide some sensitive and negative environmental information (mandatory disclosures), so the disclosed environmental information is hard to provide a basis for investors to avoid environmental risks. Given that it is difficult for external stakeholders to determine the value and the accuracy of corporate environmental information disclosure, it is necessary for the China entrepreneur club to encourage the top executives of the penalized company to shoulder the corporate environmental responsibility and attach importance to the environmental information disclosure.

Since environmental penalties reduce the integrity, comprehensibility, and relevance of environmental reports or CSR reports, we suggest that stakeholders should not just focus on the increase of information disclosure, but also be aware of the decline in the quality of environmental information. More specifically, stakeholders should pay more attention to whether the report covers the environmental situation associated with the headquarters of the group and its subordinate units. Attention should also be paid to the disclosure of the impact of energy conservation and emission reduction, as well as environmental effects of major construction projects in their environmental reports or CSR reports.

The study also has certain policy implications. First, regulators should strengthen supervision over the environmental information disclosure of penalized companies, and increase punishment for disclosure violation. Second, we suggest that the government establish a third-party auditing mechanism for the environmental information of penalized companies, which would discourage penalized companies from manipulating their environmental information disclosures. Third, given the split of regulatory functions in China, it is necessary to share the environmental information of the penalized company between the environmental protection department and the China Securities Regulatory Commission. Under the environmental administrative penalty, it is important for investors in the stock market to have easy access to information that will help them avoid environmental risk or identify a company's environmental performance.

5.3. Contributions, Limitations, and Future Research

Previous studies have found that external pressure affects environmental information disclosure. However, the extant studies do not provide insight into the effect of the environmental administrative penalty on the quality of EID, or the level of mandatory EID. To the best of our knowledge, this study is the first to theorize and provide empirical evidence to establish the relationship between the environmental administrative penalty with the level of EID, and the quality of EID. In addition, the study is the first to examine how the environmental administrative penalty affects the quality characteristics of environmental information. Our findings make several contributions to the existing literature. First, we found that although the environmental penalty improves the level of voluntary EID, it reduces the level of mandatory EID. Secondly, we found that the environmental administrative penalty reduces the quality of EID, which is mainly reflected in the weakening of the integrity, comprehensibility, and relevance of the environmental information in the CSR report or the environmental report. Thirdly, this paper provides the measurement of environmental information quality by developing an indicator system for evaluation. The construction of the quality characteristics system of environmental information extends the traditional measurement methods of environmental information quality, providing a reliable measurement basis for further academic research.

This research also has some limitations. In recent years, China's environmental protection authorities have increased environmental law enforcement efforts. The eighth meeting of the 12th National People's Congress (NPC) in 2014 voted to approve the Amendment of Environmental Protection Law, which strengthened the law enforcement power of the environmental protection departments. The government's emphasis on environmental protection at the legislative level has led to a significant increase in the number of cases of environmental penalties between 2014 and 2016. As such, we can now obtain more official data on the environmental violations of listed companies. Future studies should investigate long-term data to assess the relationship between environmental

penalties and EID quality, as policy changes may have an impact on environmental information disclosure [69,70]. Avoiding changes in environmental regulations may have a negative impact on the findings of the study, so we adopted 2014 as the starting year. Future research should continue to trace the relationship between corporate EID and the environmental penalty, because in December 2017, the China Securities Regulatory Commission uniformly revised the *Content and Format Criteria for Information Disclosure of Annual and Semi-annual Reports of Listed Companies*, and clearly required the companies of key pollution discharge units to disclose pollution discharge information and so on.

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