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The Pitfall of Selective Environmental Information Disclosure on Stock Price Crash Risk: Evidence From Polluting Listed Companies in China

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Due to incomplete legal regulation, enterprises have the motive of selective environmental information disclosure (EID), and such selective disclosure strategy may result in stock price crash risk. In this study, the EID scores of China's 1,010 polluting listed companies between 2007 and 2017 are first measured by employing the text analysis approach. Subsequently, we empirically examine the impacts of corporate's selective EID on the stock price crash risk. The results indicate that EID of China's polluting listed companies has significantly increased their stock price crash risk, rather than reducing it. Specifically, the EID of polluting companies with lower information efficiency, higher inefficient investment, higher degree of government control, and location in lower marketization areas is more likely to increase their stock price crash risk. Additional analyses reveal that the EID of polluting listed companies in China cannot reduce their stock price synchronization, which means that the selective disclosure of environmental information of China's polluting listed companies is useless, and thus cannot reduce the risk of stock price crash.

Keywords: selective environmental disclosure, stock price crash risk, polluting listed companies, corporate social responsibility, stock price synchronization

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INTRODUCTION

To cope with the worsening environmental problems, countries all over the world are strengthening environmental regulations (Shi and Xu, 2018). Environmental information disclosure (EID) is one of the regulations which can transmit the environmental information to the users (Trumpp et al., 2015). Regulators are aware of the importance of EID, which has been practiced as an important measure of environmental regulations (Zhang et al., 2016a). More and more countries in the world have established their own EID system (Li et al., 2021). More importantly, the environmental information disclosed by enterprises is more and more concerned by stakeholders (Jiang et al., 2021).

EID has obvious benefits for both enterprises and the society. It helps enterprises establish an environment-friendly image (Aragon-Correa et al., 2016). EID transfers the legitimacy of enterprises to the public, reduces the investment risk of external shareholders, and ultimately improves the financing ability of enterprises (Dhaliwal et al., 2011). Moreover, EID makes it easier for polluters to obtain green credit and reduce the cost of credit (Liu and Anbumozhi, 2009; Xu et al., 2020). Therefore, EID can further improve the financing ability of polluting enterprises (Wu et al., 2017). In addition, EID can enable consumers to obtain the information of environment-friendly products

(Dejan et al., 2019) so as to attract green consumers and cultivate their loyalty (Lev et al., 2010), thus improving the market share and financial performance of enterprises (Wang et al., 2020). The disclosure of environmental information forces polluters to adopt environmentally friendly production methods, which also helps reduce pollution (Jiang et al., 2021).

However, EID may increase the supervision pressure of high-polluting enterprises. Therefore, EID also has costs (Fisman and Wang, 2015). The more transparent a company is, the more scrutinized it will be, especially on environmental issues (King, 2008). The environmental information disclosed by companies is strictly reviewed by environmental protection organizations, which will bring pressure to them to solve environmental problems (Lyon and Maxwell, 2011). They may even boycott and protest against these companies. Therefore, EID will strengthen the supervision of enterprises and increase the accountability of polluters (Bromley and Powell, 2012). For instance, when environmental disasters occur, companies with poor environmental records attract more media attention (Luo et al., 2012). Furthermore, investors have a preference for companies with good environmental performance (Abdullah et al., 2020). They may use environmental information disclosure to assess a company's risk, just like financial disclosure (Chang et al., 2020). Eventually, enterprises may adopt strategic environmental information disclosure.

Due to incomplete legal regulation, enterprises have the discretion to disclose environmental information. For example, Kim and Lyon (2011) found that companies selectively disclose their greenhouse gas emissions to the U.S. government. Especially in developing countries, the problem of environmental information disclosure is more prominent and selective disclosure is more serious (Fonseka et al., 2019). Martins and Gomes (2021) defined selective environmental information disclosure as corporate impression management. Enterprises voluntarily choose environmental information disclosure to distort investors' evaluation (Neu et al., 1998). The result is that the EID is not neutral and unfair so as to avoid the environmental responsibility of enterprises (Merkl-Davies and Brennan, 2007). "Greenwash" has been described as a common type of selective environmental disclosure in which companies mislead the public by giving a false impression of their true environmental performance (Marquis et al., 2016).

What are the consequences of corporate's selective environmental information disclosure? Can it help polluting companies to access more external support, or will it mislead investors and even distort the allocation of resources in the capital market? According to the hypothesis of "hiding bad news" proposed by Jin and Myers (2006), the bad news withheld by the company eventually caused the company's stock price to crash. Therefore, this article mainly studies the actual impact of selective environmental information disclosure on stock price crash risk of polluting enterprises. We try to contribute to the literature from the following two aspects: first, this study sheds some light on the relationship between nonfinancial information disclosure and corporate's stock price crash risk. It demonstrates that not only the financial disclosure but also the nonfinancial information disclosure, such as the disclosure of environmental information by polluting enterprises, will impact corporate's stock price crash. Second, based on the principle of substance over form, this study objectively evaluates the economic consequences of environmental information disclosure of polluting enterprises. We should not only pay attention to whether polluting listed companies disclose environmental information but also pay attention to the specific content of their disclosure. Selective disclosure of environmental information can be worse than nondisclosure.

The remainder of this article is organized as follows: *Mechanism Analysis and Hypotheses Development* probes the theoretical mechanism of selective EID impacting corporate's stock price crash risk and puts forward the research hypothesis; *Empirical Research Design* introduces the empirical designs and dataset; *Empirical Results and Discussions* reports the empirical results and discusses them; and *Conclusions and Implications* concludes the article.

MECHANISM ANALYSIS AND HYPOTHESIS DEVELOPMENT

Literature Reviews

Stock price crashes are the sharp and continuous collapse of stock prices, which have become a hot issue of financial institutions and regulators (Chen et al., 2001). Concerning the reasons of stock price crash, scholars have put forward their own opinions from different perspectives. For example, Black (1976) believed that a company's leverage structure may have an adverse impact on its stock price and even cause the stock price to crash. Zeira (1999) proposed that fundamental changes lead to investors' overreaction, which results in stock market fluctuations from prosperity to a crash. According to Jin and Myers (2006), information asymmetry enables managers to hide bad news for various reasons, such as maximizing compensation or protecting employment (Cai et al., 2019). Once the negative information is disclosed, the stock price of the company may fall sharply (Habib et al., 2018).

Following Jin and Myers (2006), numerous studies have examined the impact of financial information disclosure on the stock price crash. For example, Hutton et al. (2009) argued that firms with a substantial amount of discretionary accruals are prone to stock price crash. Kim and Zhang (2016) demonstrated that firms with less conservative accounting practices are associated with a higher likelihood of future stock price crash risk. Moreover, firms with high unreliable accruals (Zhu, 2016) and high earning smoothing behavior (Chen et al., 2018) tend to exhibit increased stock price crash risk. Jung et al. (2019) find a statistically significant and positive association between U.S. banks' delayed expected loss recognition and the subsequent period stock price crash when managers have high discretion in concealing bad news. Jin et al. (2019) found that economic policy uncertainty affects crash risk through managers' concealment of bad news and investors' heterogeneous beliefs.

As we summarize from existing studies, we see that they have discussed the impacts of financial information disclosure on the risk of stock price crash, but little attention has been paid to the

impacts of nonfinancial information disclosure on the risk of corporate's stock price crash. However, investors not only pay attention to financial information but also to nonfinancial information, such as the environmental information disclosed by polluting enterprises. In what follows, we deeply probe the theoretical mechanism by which selective EID impacts corporate's stock price crash.

EID and Stock Price Crash

EID is an important regulation to reduce the information asymmetry of the pollution industry (Zhu and Zhang, 2012). On the one hand, it allows external and internal information systems to make comprehensive assessments on companies' environmental performance (Jenkins and Yakovleva, 2006). On the other hand, it can alleviate the information asymmetry between management and investors, thus reducing the agency problem in the environments characterized (Martinezferrero et al., 2016). EID aims to alleviate the negative economic consequences such as the conflict of interest caused by information asymmetry (Yan et al., 2017). For instance, Du (2018) found that EID could alleviate the information asymmetry between domestic and foreign investors, thus attracting overseas financing. Ni (2016) found that high-quality EID can reduce the environmental information asymmetry between creditors and high-polluting enterprises.

In addition, EID is valuable for reducing the investment risk of enterprises and improving the risk assessment of investors (Ashbaugh-Skaife et al., 2010). Enterprises with higher environmental information quality may also have higher ethical standards (Kim et al., 2014). The value correlation of EID reduces the uncertainty of corporate valuation (Dhaliwal et al., 2011). Therefore, high-quality EID can help investors make effective investment decisions and improve the pricing efficiency of the capital market (Chang et al., 2020). Therefore, EID has always been treated as a useful signal for investors (Wu and Hu, 2019).

Overall, as EID reduces the environmental information asymmetry and improves the pricing efficiency of polluting enterprises (Zhu and Zhang, 2012), it may ultimately reduce the stock price crash risk (Defond et al., 2015; Kim and Zhang, 2016). Therefore, the following hypothesis is proposed:

H1a: The EID of polluting listed companies will reduce their stock price crash risk.

However, from the perspective of agency cost, firms may be strategic in environmental information disclosure to avoid or minimize negative reactions from investors (Gleason et al., 2020). According to the selective disclosure, enterprises with better environmental performance are more willing to disclose high-quality environmental information; however, enterprises with poor environmental performance choose to disclose more soft information on environmental performance.

The management's self-interest and information asymmetry ultimately lead to selective disclosure of environmental information (Benmelech et al., 2010; Kim et al., 2016). Some polluting companies even hide some key environmental information with the excuses of "national security, public security, economic security, or social stability" (He et al., 2014). The result is that positive environmental information is disclosed and negative environmental information is hidden (Huang et al., 2011; Habib and Hasan, 2017). For instance, Jin et al. (2019), Petrovits (2006), and Prior et al. (2008) demonstrated that managers use corporate social responsibility to seek rents, protect their jobs, and manage earnings. Hemingway and Maclagan (2004) and Kim et al. (2014) believed that management may use corporate social responsibility to cover up their misconducts and divert shareholders' attention from their misconducts.

Polluting enterprises are facing serious political and social pressures, which threatens their legitimacy (Meng et al., 2013). As a result, they will be expected to provide more positive environmental information disclosures to the public in their annual reports (Clarkson et al., 2008). Altuwaijri et al. (2004) refer to this as "greenwashing," in which management puts its best "spin" on what otherwise might be a lackluster environmental performance.

Thus, EID is seen as a means used by management to hide unethical behavior (Wu and Hu, 2019), which ultimately increases the risk of a stock price crash. **Figure 1** further illustrates the asymmetry of the EID system.

Among them, the regulators hope to force enterprises to take necessary environmental protection measures by requiring them to disclose their environmental contributions (Zhang et al., 2016b). However, enterprises with ulterior motives may selectively disclose their environmental contributions and avoid disclosing their environmental threats, thus leading to bias in the disclosure of environmental information (Altuwaijri et al., 2004).

This asymmetry of environmental information disclosure will weaken the effectiveness of environmental regulation. Selective EID means more information opacity, which creates more opportunities for polluting enterprises to withhold bad news. With the accumulation of hidden negative information, the stock price will probably collapse in the future (Jin and Myers, 2006).

Therefore, this study proposes the following hypothesis:

H1b: The selective EID of polluting listed companies will increase their stock price crash risk.

EID and Stock Price Synchronization

Stock price synchronization is an important index for measuring the information efficiency of stock price (Morck et al., 2000), which refers to the correlation between stock volatility and market volatility. High stock price synchronization will seriously damage the efficiency of capital allocation (Jin and Myers, 2006). The higher the synchronization of stock price, the lower the information efficiency of stock price (Heng and Ting, 2011; Song, 2015), which will ultimately increase the risk of stock price crash (Jin et al., 2016).

The disclosure of useful information is an important measure to reduce the stock price synchronization (Wurgler, 2000). When a company's disclosure quality improves, investors are able to accurately predict its future firm-specific earnings (Farooq and Hamouda, 2016; Didar et al., 2018). Therefore, the firm's shares will be embedded with more firm-specific information, and there will be low stock price synchronicity (Song, 2015; Zhou et al.,

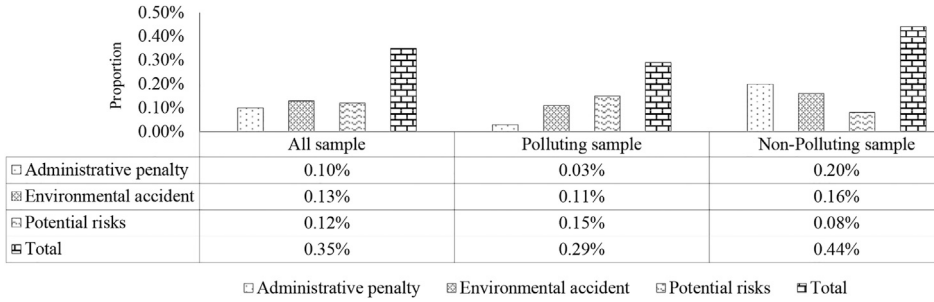

FIGURE 1 | Asymmetry of environmental information disclosure.

2019). EID also has the function of information transmission (Qiu et al., 2016). For instance, Plumlee et al. (2015) found that EID would affect the cash flow and equity financing cost of enterprises, thus affecting the enterprise value. Nor et al. (2016) demonstrated that in order to attract investors' attention, the management would pay more attention to the disclosure of environmental information. Dai et al. (2018) believed that when corporates' social responsibility reports enable investors to have more firm-specific information, the synchronization of stock prices is lower.

Therefore, firms adopt an appropriate disclosure of environmental information, and external investors can collect information on corporates' environmental responsibility and finally reduce the stock price synchronization and stock price crash risk (Jin et al., 2016).

For these reasons, the following hypothesis is proposed:

H2a: The EID of polluting listed companies will reduce the stock price crash risk by reducing their stock price synchronization.

However, due to the selective EID, companies actively disclose their environmental contributions while avoiding disclosing the environmental threats (Zhang et al., 2016a). Even excessive or exaggerated disclosure of uncritical information will mislead investors, thus reducing the information efficiency of the stock market. Especially in some emerging markets where market mechanisms are not so perfect, firms are more likely to speculate (Fonseka et al., 2019). They will use EID as a self-interested tool to release low-quality CSR reports to cover up their negative operating conditions (Dai et al., 2018). As a result, the EID of polluting listed companies may not be able to reduce their stock price crash risk by reducing their stock price synchronization.

In this situation, this study proposes the following hypothesis:

H2b: The EID of polluting listed companies cannot reduce the stock price crash risk by reducing their stock price synchronization.

EMPIRICAL RESEARCH DESIGN

Measurement of Stock Price Crash Risk

In order to measure the risk of corporate's stock price crash, Chen et al. (2001) constructed two indicators, *NCSKEW* and *DUVOL*, which were further improved by Hutton et al. (2009). They have been widely used in the study of crash risk of stock prices, such as Defond et al. (2015), Si and Zhan (2019), and Xu et al. (2021). Therefore, *NCSKEW* and *DUVOL* are also used as stock price crash risk indicators in this study. We first estimate the firm-specific weekly returns for each firm and year as follows:

$$R_{i,t} = \alpha + \beta_1 R_{m,t-2} + \beta_2 R_{m,t-1} + \beta_3 R_{m,t} + \beta_4 R_{m,t+1} + \beta_5 R_{m,t+2} + \varepsilon_{i,t}, \tag{1}$$

where $R_{i,t}$ is the company's t-week return and $R_{m,t}$ is the market's t-week return. The firm-specific weekly return for firm i in week t is measured by the natural log of one plus the residuals in **Eq. 1**:

$$W_{i,t} = \ln(1 + \varepsilon_{i,t}). \tag{2}$$

The crash risk proxies, NCSKEW and DUVOL, are then calculated:

$$NCSKEW_{i,T} = -\left[n_{i,t}(n_{i,t}-1)^{3/2}\sum W_{i,t}^3\right] \Big/ \left[(n_{i,t}-1) \times (n_{i,t}-2)\left(\sum W_{i,t}^2\right)^{3/2}\right] \tag{3}$$

$$\mathrm{DUVOL_{i,T}} = \mathrm{Ln}\left\{\left[\left(\mathrm{n_{i,t,Up}}-1\right)\sum \mathrm{R_{i,t,Down}^2}\right] \Big/ \left[\left(\mathrm{n_{i,t,Down}}-1\right) \times \sum \mathrm{R_{i,t,Up}^2}\right]\right\} \tag{4}$$

where $NCSKEW_{i,T}$ is the skewness of the firm-specific weekly returns, $DUVOL_{i,T}$ is the asymmetric volatility of negative vs. positive returns, $n_{i,t}$ is the number of trading weeks, $n_{i,t,Up}$ is the frequency with which the ith company's abnormal weekly return is higher than the average abnormal weekly return, and $n_{i,t,Down}$ is the frequency with which the ith company's abnormal weekly return is lower than the average abnormal weekly return. The greater the $NCSKEW_{i,T}$ and $DUVOL_{i,T}$, the greater the risk of stock price crash (Chen et al., 2001).

Measurement of EID

Text content analysis is a very popular method of collecting environmental information from relevant reports. Given that China's listed companies are all required to disclose their annual social responsibility reports, this study adopts the method of text analysis to measure the quality of enterprise EID (Chen et al., 2018; Xu et al., 2020).

TABLE 1 | Definitions of main variables.

Type	Name	Definition	Calculation
Dependent	*NCSKEW*	Stock price crash	Calculated by **Eq. 3**
	DUVOL	Stock price crash	Calculated by **Eq. 4**
Mediator	*SYN*	Stock price informativeness	Calculation based on market adjustment model
Independent	*AR*	Annual abnormal returns	Annual average abnormal return multiplied by 10^4
	EID	Environmental information	Quantity of environmental information disclosed
	SIGMA	Volatility of abnormal return	
	ABSDA	Accounting information quality	Calculated using the modified Jones model
	SIZE	Asset size	Logarithm of total assets
	LEV	Asset–liability ratio	Total liabilities divided by total assets
	ROA	Percentage of fixed assets	Net profit divided by total assets
	BOARD	Board governance	
	ANALYS	Analyst rating	Average analyst rating
	SHARE	Market share	Company assets divided by total assets of industry
	PPE	Percentage of fixed assets	Total fixed assets divided by total assets
	AGE	Operating life	The age of the company

Specifically, the quality of corporate's environmental information disclosure is measured by the number of items of environmental information disclosed in the corporate social responsibility report. First, we download the statistical table of the listed companies' social responsibility reports from the CSMAR database. Second, we select environment and sustainable development information from the statistical table. Third, we calculate the number of environment and sustainable development information disclosed by each company every year.

Model Design

To test whether selective EID impacts companies' stock price crash risk, this study builds the following econometric model referring to Defond et al. (2015):

$$NCSKEW_{i,T+1} \text{ or } DUVOL_{i,T+1} = C + \rho EID_{i,T} + \beta CV_{si,T} + \eta + \mu + \varphi + \varepsilon \tag{5}$$

In **Eq. 5**, *NCSKEW* and *DUVOL* are the indicators for stock price crash risk (Chen et al., 2001; Hutton et al., 2009; Defond et al., 2015). *EID* is an indicator for the company's environmental information disclosure, and ρ is the impact of EID on the stock price crash risk. *CVs* represents the control variables, including the average analyst's rating (*ANALYS*), annual average abnormal return (*AR*), volatility of abnormal returns (*SIGMA*), fixed assets proportion (*PPE*), logarithm of total assets (*SIZE*),the leverage ratio (*LEV*), accounting information quality (*ABSDA*), enterprise age (*AGE*), board size (*BOARD*), and return on total assets (*ROA*). Here, η represents the dummy variable of the year, μ represents the dummy variable of the province, and φ represents the dummy variable of the industry, controlling the year effect, province effect, and industry effect, respectively. **Table 1** provides definitions of variables in this study.

Description of Samples and Variables

With the remarkable economic growth in the past 4 decades, China is currently facing various serious environmental problems (Zeng et al., 2010; Peng et al., 2018). In order to cope with these severe environmental problems, the Chinese government is increasingly emphasizing green development and striving to achieve a win-win situation between economic growth and environmental protection (Wang et al., 2015). Regulators are aware of the importance of corporate environmental information disclosure (EID) (Zhang et al., 2016a), which has been practiced as an important measure of environmental regulations in China (Clarkson et al., 2008).

Due to the incompleteness of EID policy, China's listed companies are encouraged to disclose their environmental contributions, rather than environmental threats such as environmental accidents or risks (Zhang et al., 2016b). **Figure 2** shows the statistical results of environmental responsibility information disclosed by Chinese A-share listed companies from 2007 to 2017. It can be seen that the proportion of negative environmental information disclosed by Chinese listed companies is less than 0.5%.

Consequently, this study takes Chinese A-share listed companies from 2007 to 2017 as research samples. Polluting companies are selected as experimental samples, while nonpolluting companies are taken as control samples. Following Chen et al. (2018), companies in the heavy pollution industry are categorized as polluting firms. According to the Guidelines for Environmental Information Disclosure for Listed Companies issued by China's Ministry of Environmental Protection in 2010, there are 16 heavy pollution industries: electrical power, steel, cement, electrolytic aluminum, coal, metallurgy, building materials, mining, petrochemical, chemicals, pharmaceutical, brewing, paper-making, fermentation, textile, and leather-making. The industry distribution statistics are shown in Panel A of **Table 2**.

The financial statement information, CSR report information, and stock price information are collected from the CSMAR database. The CSMAR is one of the most authoritative databases of listed companies in China (Chen et al., 2018). Descriptive statistics of variables are shown in Panel B of **Table 2**.

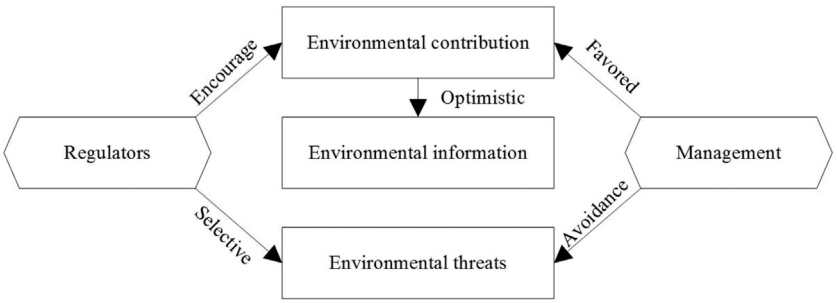

FIGURE 2 | Statistics of negative environmental information disclosure of Chinese listed companies.

TABLE 2 | Sample and variable descriptive statistics.

Panel A: sample industry distribution statistics

Industry name	Frequency	Percent
Power, heat production, and supply industry	76	2.04%
Ferrous metal mining and beneficiation industry	5	0.13%
Ferrous metal smelting and rolling industry	38	1.02%
Nonferrous metal mining and processing industry	24	0.64%
Nonferrous metal smelting and rolling industry	72	1.93%
Nonmetallic mineral products industry	90	2.41%
Oil and gas extraction	5	0.13%
Petroleum processing, coking, and nuclear fuel processing industry	17	0.46%
Chemical fiber manufacturing	22	0.59%
Chemical raw materials and chemical products manufacturing industry	242	6.48%
Pharmaceutical manufacturing	223	5.97%
Textile, clothing, and apparel industry	79	2.12%
Rubber and plastic products industry	75	2.01%
Paper and paper products industry	31	0.83%
Wine, beverage, and refined tea manufacturing	46	1.23%
Coal mining and washing industry	26	0.70%
Leather, fur, feather, and their products and footwear industry	11	0.29%
Other nonpolluting industries	2,651	71.02%
Total	3,733	100.00%

Panel B: variable descriptive statistics

Variable name	Mean	SD	Min	Max
NCSKEW	−0.241	0.622	−2.127	1.257
DUVOL	−0.162	0.453	−1.263	0.916
SYN	−0.710	1.055	−9.411	2.091
AR	−1.332	1.032	−5.631	−0.151
EID	0.918	3.505	0.000	24.000
SIGMA	0.049	0.018	0.018	0.107
ABSDA	0.065	0.086	0.000	0.530
SIZE	21.943	1.425	19.114	27.035
LEV	0.300	0.177	0.036	0.935
ROA	0.042	0.052	−0.162	0.196
BOARD	10.115	2.613	5.000	19.000
ANALYS	4.198	0.489	3.000	5.000

EMPIRICAL RESULTS AND DISCUSSIONS

Benchmark Empirical Results

Table 3 presents the impacts of corporates' selective EID on the stock price crash risk, with $NCSKEW_{T+1}$ and $DUVOL_{T+1}$ as the dependent variables, respectively. For all samples, the parameter estimations of EID in Columns (1) and (4) are positive but not statistically significant at the 10% level. Furthermore, the samples are divided into polluting companies (*EXP*) and nonpolluting companies (*CON*). For polluting companies, the regression coefficients of EID in Columns (2) and (5) are both positive and statistically significant. In contrast, for nonpolluting

TABLE 3 | Effect of environmental information disclosure risk.

	$NCSKEW_{T+1}$			$DUVOL_{T+1}$		
	All	**EXP**	**CON**	**All**	**Exp**	**Con**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
EID_T	0.0018	0.0048**	−0.0020	0.0012	0.0027*	−0.0009
	(1.146)	(2.322)	(−0.913)	(1.075)	(1.742)	(−0.609)
AR_T	0.0998***	0.0371	0.1307***	0.0678***	0.0161	0.0936***
	(3.851)	(0.702)	(4.265)	(3.736)	(0.474)	(4.272)
$SIGMA_T$	7.2176***	2.8831	9.5497***	4.9095***	1.6641	6.6826***
	(4.679)	(0.985)	(5.111)	(4.524)	(0.863)	(4.997)
$ABSDA_T$	0.0618	−0.1115	0.0889	−0.0119	−0.0440	−0.0137
	(0.823)	(−0.776)	(1.006)	(−0.224)	(−0.422)	(−0.220)
$SIZE_T$	−0.0583***	−0.0582***	−0.0539***	−0.0493***	−0.0448***	−0.0505***
	(−8.994)	(−5.553)	(−6.281)	(−10.452)	(−5.699)	(−8.187)
LEV_T	0.0379	−0.1396	0.0991*	0.0248	−0.1075	0.0776*
	(0.805)	(−1.516)	(1.730)	(0.713)	(−1.627)	(1.808)
ROA_T	0.5169***	0.2383	0.7088***	0.3707***	0.2995**	0.4463***
	(4.125)	(1.217)	(4.268)	(4.021)	(2.069)	(3.711)
$BOARD_T$	−0.0015	−0.0044	0.0003	−0.0020	−0.0042	−0.0009
	(−0.652)	(−1.154)	(0.094)	(−1.179)	(−1.507)	(−0.408)
$ANALYS_T$	0.1084***	0.1204***	0.1030***	0.0704***	0.0656***	0.0718***
	(7.904)	(4.882)	(6.148)	(7.162)	(3.837)	(5.928)
C	0.1202	0.2790	−0.0616	0.2551**	0.2996	0.2069
	(0.766)	(0.997)	(−0.312)	(2.259)	(1.516)	(1.462)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Province	Yes	Yes	Yes	Yes	Yes	Yes
N	12,076	3,904	8,172	12,076	3,904	8,172

This table presents regression results for the effect of environmental information disclosure. The dependent variables are $NCSKEW_{T+1}$ *and* $DUVOL_{T+1}$. $NCSKEW_{T+1}$ *is the negative skewness of firm-specific weekly returns in year* T+1. $DUVOL_{T+1}$ *is down-to-up volatility in* T+1*, which equals the log of the ratio of the standard deviations of down weeks' firm-specific returns to that of up weeks. The key independent variable is environmental information disclosure,* EID_T. *Columns (1) and (4) are regressed by all companies (*ALL*). Columns (2) and (5) are regressed by polluting companies (*EXP*). Columns (3) and (6) are regressed by non-polluting companies (*CONT*). All continuous variables are winsorized at the 1 and 99% percentiles. T-statistics reported in parentheses are based on standard errors clustered by firm.*, **, and *** represent significance at the 10, 5, and 1% levels, respectively.*

companies, the regression coefficients of EID are negative but not statistically significant at the 10% level. It can be concluded that corporate's selective EID can significantly increase the stock price crash risk of polluting companies (*H1b*).

The results indicate that the quality of EID of Chinese enterprises is low. Companies disclose especially favorable environmental information and hardly disclose problematic (i.e., accidents and emissions above standards) and quantitative data (Zhang et al., 2016a). According to Liu and Anbumozhi (2009) and Zeng et al. (2010), nearly 40% of the sampled companies in China disclosed no substantial environmental information; they are selectively disclosing their environmental information. Polluting companies often use "public security and economic security" as arguments for continuing confidentiality of environmental information (He et al., 2014), which goes against the authenticity and integrity of the disclosure and finally increases the stock price crash risk.

Regarding the control variables, stock price crash risk is positively correlated with annual average abnormal returns (AR_t), volatility of abnormal returns ($SIGMA_t$), return on total assets (*ROAt*), and average analysts' ratings (*ANALYSt*). On the contrary, it is negatively correlated with the logarithm of total assets ($SIZE_t$). It suggests that firms with higher returns, greater volatility, higher analyst rating, and smaller size are more likely to be crash-prone (Chen et al., 2019).

Subsample Analyses

The management's ability to hide bad news is limited (Jin and Myers, 2006; Hutton et al., 2009). The more bad news is hidden, the greater the risk of stock price crash (Kim et al., 2016). Therefore, this part further discusses the impact of information efficiency, ownership, inefficient investment, and marketization for enterprises, which may influence the ability of management to hide bad news.

The empirical results are reported in **Table 4**. The samples in Columns (1–4) are low–information efficiency polluting companies, state-owned polluting companies, high–inefficient investment polluting companies, and polluting companies in low marketization areas, respectively. The samples in Columns (5–8) are high–information efficiency polluting companies, non–state-owned polluting companies, low–inefficient investment polluting companies, and polluting companies in high marketization areas, respectively.

It can be seen that environmental information disclosure (*EID*) of low–information efficiency polluting companies, state-owned polluting companies, high–inefficient investment polluting companies, and polluting companies in low-marketization areas will significantly increase their stock price crash risk [Columns (1–4)], while the regression results of other polluting companies are not statistically significant [Columns (5–8)]. It suggests that the stock price information efficiency will

TABLE 4 | Subsample test of information efficiency.

	Column (1)	Column (2)	Column (3)	Column (4)	Column (5)	Column (6)	Column (7)	Column (8)
Panel A: the dependent variable is $NCSKEW_{T+1}$								
EID_T	0.0081***	0.0067***	0.0058**	0.0076***	−0.0003	−0.0029	0.0031	0.0007
	(2.934)	(2.92)	(2.04)	(2.93)	(−0.101)	(−0.61)	(1.04)	(0.22)
AR_T	0.0610	0.0104	0.0547	0.0482	−0.0129	0.1016	0.0332	0.0154
	(0.857)	(0.12)	(0.76)	(0.65)	(−0.126)	(1.42)	(0.41)	(0.20)
$SIGMA_T$	4.3440	−1.0979	3.5216	3.5011	−1.2734	8.9155**	2.5969	1.9134
	(1.096)	(−0.24)	(0.86)	(0.88)	(−0.223)	(2.09)	(0.59)	(0.42)
$ABSDA_T$	−0.1481	0.3639*	−0.3741*	−0.0350	−0.1123	−0.4894**	0.2494	−0.3492
	(−0.687)	(1.93)	(−1.87)	(−0.19)	(−0.551)	(−2.46)	(1.15)	(-1.39)
$SIZE_T$	−0.0544***	−0.0580***	−0.0315**	−0.0584***	−0.0651***	−0.0390*	−0.1027***	−0.0564***
	(−4.139)	(−4.60)	(−2.19)	(−4.30)	(−3.482)	(−1.90)	(−5.83)	(−3.27)
LEV_T	−0.2450**	−0.0989	−0.2558*	−0.0159	−0.0293	−0.2205	0.1167	−0.3579**
	(−1.993)	(−0.83)	(−1.82)	(−0.14)	(−0.196)	(−1.32)	(0.95)	(−2.20)
ROA_T	0.0936	0.2116	0.0773	0.3298	0.1683	0.1198	0.4349	0.0294
	(0.362)	(0.85)	(0.29)	(1.35)	(0.531)	(0.37)	(1.41)	(0.09)
$BOARD_T$	−0.0043	−0.0121**	−0.0053	−0.0043	−0.0068	0.0062	−0.0043	−0.0058
	(−0.785)	(−2.57)	(−0.98)	(−0.89)	(−1.145)	(0.96)	(−0.71)	(−0.95)
$ANALYS_T$	0.1209***	0.1220***	0.0863**	0.1117***	0.1160***	0.1223***	0.1529***	0.1340***
	(3.868)	(4.03)	(2.44)	(3.58)	(2.635)	(2.98)	(4.14)	(3.29)
C	0.1649	0.3941	−0.0219	0.2891	0.4822	−0.4074	1.4028***	0.1416
	(0.476)	(1.17)	(−0.06)	(0.82)	(0.939)	(−0.80)	(3.13)	(0.28)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,437	2,112	1932	2,313	1,467	1792	1972	1,591
Panel B: the dependent variable is $DUVOL_{T+1}$								
EID_T	0.0044**	0.0041**	0.0045**	0.0053***	−0.0001	−0.0030	0.0009	−0.0011
	(2.243)	(2.34)	(2.03)	(2.74)	(−0.026)	(−0.77)	(0.39)	(−0.41)
AR_T	0.0534	−0.0095	0.0440	−0.0091	−0.0355	0.0600	0.0044	0.0297
	(1.159)	(−0.17)	(0.91)	(−0.19)	(−0.528)	(1.26)	(0.09)	(0.58)
$SIGMA_T$	3.9425	−1.5780	3.0240	0.1298	−2.4947	5.7306**	0.7533	2.7478
	(1.511)	(−0.53)	(1.09)	(0.05)	(−0.643)	(1.98)	(0.26)	(0.90)
$ABSDA_T$	−0.0731	0.2672*	−0.2640*	−0.0289	−0.0595	−0.2780**	0.3051*	−0.1138
	(−0.470)	(1.82)	(−1.78)	(−0.22)	(−0.392)	(−1.98)	(1.88)	(−0.60)
$SIZE_T$	−0.0369***	−0.0421***	−0.0314***	−0.0420***	−0.0567***	−0.0414***	−0.0661***	−0.0488***
	(−3.816)	(−4.33)	(−3.02)	(−4.40)	(−4.024)	(−2.71)	(−5.21)	(−3.64)
LEV_T	−0.1628*	−0.0728	−0.1875*	−0.0268	−0.0494	−0.0991	0.0597	−0.2108*
	(−1.832)	(−0.80)	(−1.85)	(−0.34)	(−0.488)	(−0.83)	(0.70)	(−1.93)
ROA_T	0.2195	0.3215	0.2630	0.3078*	0.2483	0.2395	0.3141	0.2574
	(1.192)	(1.65)	(1.29)	(1.68)	(1.017)	(1.02)	(1.46)	(1.06)
$BOARD_T$	−0.0032	−0.0096***	−0.0051	−0.0062*	−0.0068	0.0035	−0.0037	−0.0017
	(−0.878)	(−2.76)	(−1.25)	(−1.80)	(−1.517)	(0.72)	(−0.90)	(−0.37)
$ANALYS_T$	0.0679***	0.0808***	0.0400	0.0787***	0.0631**	0.0367	0.0913***	0.0348
	(3.156)	(3.79)	(1.61)	(3.71)	(1.979)	(1.25)	(3.63)	(1.17)
C	0.0523	0.2603	0.2323	0.2305	0.6157	0.2044	0.8632***	0.4045
	(0.216)	(1.07)	(0.90)	(0.98)	(1.582)	(0.55)	(2.75)	(1.11)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,437	2,112	1932	2,313	1,467	1792	1972	1,591

*This table presents regression results for the subsample test. Following Morck et al. (2000), Durnev et al. (2004), the market adjustment model is used to measure stock price synchronization (*SYN*). The high stock price information efficiency means that the stock price synchronization (*SYN*) is lower than the average level. The low stock price information efficiency means that the stock price synchronization (*SYN*) is higher than the average level. Referring to Richardson (2006), this study uses the investment efficiency model to measure companies' inefficient investment (*INV*). The high inefficient investment means that the inefficient investment (*INV*) is higher than the average level. The low inefficient investment means that the inefficient investment (*INV*) is lower than the average level. According to marketization index of each province in China (Wang et al., 2019), we further divide samples into high-marketization polluting companies and low-marketization polluting companies. The dependent variables are* $NCSKEW_{T+1}$ *and* $DUVOL_{T+1}$. $NCSKEW_{T+1}$ *is the negative skewness of firm-specific weekly returns in year* T+1. $DUVOL_{T+1}$ *is down-to-up volatility in* T+1, *which equals the log of the ratio of the standard deviations of down weeks' firm-specific returns to that of up weeks. The key independent variable is environmental information disclosure,* EID_T. *All continuous variables are winsorized at the 1 and 99% percentiles. T-statistics reported in parentheses are based on standard errors clustered by firm.*, **, and *** represent significance at the 10, 5 and 1% levels, respectively.*

TABLE 5 | Test of information efficiency mechanism.

	SYN_{T+1}		$NCSKEW_{T+1}$		$DUVOL_{T+1}$	
	EXP	CON	EXP	CON	EXP	CON
	(1)	(2)	(3)	(4)	(5)	(6)
SYN_{T+1}			0.0099	0.0430***	0.0038	0.0298***
			(0.85)	(4.61)	(0.44)	(4.52)
EID_T	0.0015	−0.0049*	0.0049**	−0.0020	0.0027*	−0.0008
	(0.46)	(−1.78)	(2.31)	(−0.87)	(1.74)	(−0.51)
AR_T	−0.2114***	−0.2742***	0.0392	0.1457***	0.0169	0.1018***
	(−2.64)	(−6.69)	(0.73)	(4.69)	(0.50)	(4.65)
$SIGMA_T$	−13.4619***	−19.8663***	3.0554	10.5827***	1.7156	7.2750***
	(−2.94)	(−7.68)	(1.03)	(5.59)	(0.89)	(5.44)
$ABSDA_T$	−0.2487	−0.3233**	−0.1153	0.1001	−0.0431	−0.0041
	(−1.33)	(−2.57)	(−0.79)	(1.11)	(−0.41)	(−0.06)
$SIZE_T$	0.0824***	0.1145***	−0.0595***	−0.0586***	−0.0451***	−0.0539***
	(4.67)	(9.07)	(−5.59)	(−6.61)	(−5.69)	(−8.60)
LEV_T	−0.3460**	−0.2993***	−0.1395	0.1144**	−0.1061	0.0865**
	(−2.26)	(−3.76)	(−1.49)	(1.97)	(−1.60)	(2.02)
ROA_T	0.0956	−0.5966**	0.2412	0.7533***	0.2991**	0.4641***
	(0.25)	(−2.16)	(1.22)	(4.43)	(2.06)	(3.82)
$BOARD_T$	0.0030	0.0063	−−0.0044	0.0000	−0.0042	−0.0011
	(0.46)	(1.64)	(−1.14)	(0.01)	(−1.51)	(−0.50)
$ANALYS_T$	−0.0426	−0.0822***	0.1216***	0.1067***	0.0658***	0.0743***
	(−1.22)	(−4.01)	(4.89)	(6.28)	(3.85)	(6.12)
C	−1.3610***	−1.7786***	0.2934	0.0015	0.3048	0.2600*
	(−3.37)	(−6.12)	(1.04)	(0.01)	(1.54)	(1.82)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Province	Yes	Yes	Yes	Yes	Yes	Yes
N	3,904	8,172	3,904	8,172	3,904	8,172

This table presents regression results for the additional analyses. Following Morck et al. (2000), Durnev et al. (2004), the market adjustment model is used to measure stock price synchronization (SYN). Columns (1) and (2) present the first regression results. The dependent variables is SYN_{T+1}*, which is measured by market adjustment model in year T+1. The key independent variable is environmental information disclosure,* EID_T*. Column (1) is regressed by polluting companies (EXP). Column (2) is regressed by nonpolluting companies (CONT). Columns (3–6) present the second regression results. The dependent variables are* $NCSKEW_{T+1}$ *and* $DUVOL_{T+1}$*.* $NCSKEW_{T+1}$ *is the negative skewness of firm-specific weekly returns in year T+1.* $DUVOL_{T+1}$ *is down-to-up volatility in T+1, which equals the log of the ratio of the standard deviations of down weeks' firm-specific returns to that of up weeks. The key independent variable is stock price synchronization (*SYN_{T+1}*) and environmental information disclosure (*EID_T*). Columns (3) and (5) are regressed by polluting companies (EXP). Columns (4) and (6) are regressed by non-polluting companies (CONT). All continuous variables are winsorized at the 1 and 99% percentiles. T-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** represent significance at the 10, 5, and 1% levels, respectively.*

reduce the ability of the management to conceal bad news, thus reducing the risk of stock price crash triggered by selective environmental information disclosure (Jin and Myers, 2006; Jin et al., 2016). But the state-owned companies, inefficient investment companies, and the companies in lower marketization areas are more likely to report an artificially "green" environment (Zeng et al., 2010; Kim et al., 2016; Habib and Hasan, 2017; Zhou et al., 2019), which results in a higher stock price crash risk.

Further Analyses

In this section, we try to further probe the inner mechanism by which corporate's selective EID impacts its risk of stock price crash. Due to the selectivity of information disclosure, EID cannot improve the informativeness of stock prices, which ultimately reduces the information efficiency of the capital market. Therefore, we further constructed the following models:

$$SYN_{i,T+1} = C + \kappa EID_{i,T} + \beta CV_{si,T} + \eta + \mu + \varphi + \varepsilon \quad (6)$$

$$NCSKEW_{i,T+1} \text{ or } DUVOL_{i,T+1} = C + \pi SYN_{i,T+1} + \rho EID_{i,T} + \beta CV_{si,T} + \eta + \mu + \varphi + \varepsilon \quad (7)$$

In **Eqs 6**, **7**, *SYN* is companies' stock price synchronization, which indicates the stock price information efficiency (Morck et al., 2000; Durnev et al., 2004). If the coefficients κ and π are significantly different from 0 at the same time, it means that EID may affect the stock price crash risk by influencing their stock price synchronization. Otherwise, EID cannot affect the stock price crash risk by influencing their stock price synchronization. The empirical results are reported in **Table 5**.

The results show that there are significant negative impacts of environmental information disclosure (*EID*) on the stock price synchronization (SYN_{T+1}) within the nonpolluting companies. In contrast, environmental information disclosure (*EID*) has no significant impact on polluting companies' stock price synchronization. Furthermore, the results show that stock price synchronization (SYN_{T+1}) will only significantly increase the nonpolluting companies' stock price crash risk.

TABLE 6 | Robustness test of substitution variables.

	$NCSKEW_{T+1}$			$DUVOL_{T+1}$		
	All	EXP	CON	All	EXP	CON
	(1)	(2)	(3)	(4)	(5)	(6)
$EIDS_T$	0.0011	0.0035*	−0.0033	0.0011	0.0023*	−0.0014
	(0.756)	(1.931)	(−1.407)	(1.056)	(1.692)	(−0.797)
AR_T	0.0993***	0.0353	0.1303***	0.0678***	0.0154	0.0935***
	(3.834)	(0.668)	(4.256)	(3.738)	(0.453)	(4.273)
$SIGMA_T$	7.1967***	2.7762	9.5042***	4.9169***	1.6252	6.6657***
	(4.664)	(0.948)	(5.093)	(4.532)	(0.842)	(4.993)
$ABSDA_T$	0.0604	−0.1094	0.0921	−0.0128	−0.0422	−0.0124
	(0.804)	(−0.760)	(1.042)	(−0.242)	(−0.404)	(−0.199)
$SIZE_T$	−0.0572***	−0.0575***	−0.0540***	−0.0490***	−0.0451***	−0.0506***
	(−8.889)	(−5.412)	(−6.431)	(−10.500)	(−5.667)	(−8.420)
LEV_T	0.0374	−0.1426	0.1004*	0.0250	−0.1085	0.0781*
	(0.793)	(−1.546)	(1.752)	(0.717)	(−1.641)	(1.820)
ROA_T	0.5158***	0.2350	0.7150***	0.3692***	0.2973**	0.4489***
	(4.117)	(1.201)	(4.304)	(4.005)	(2.054)	(3.731)
$BOARD_T$	−0.0015	−0.0043	0.0003	−0.0020	−0.0042	−0.0009
	(−0.641)	(−1.132)	(0.102)	(−1.184)	(−1.505)	(−0.404)
$ANALYS_T$	0.1083***	0.1208***	0.1029***	0.0704***	0.0659***	0.0718***
	(7.900)	(4.898)	(6.150)	(7.169)	(3.857)	(5.931)
C	0.0969	0.2658	−0.0581	0.2488**	0.3048	0.2100
	(0.620)	(0.941)	(−0.299)	(2.219)	(1.530)	(1.513)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Province	Yes	Yes	Yes	Yes	Yes	Yes
N	12,076	3,904	8,172	12,076	3,904	8,172

This table presents regression results for the effect of environmental information disclosure. The dependent variables are $NCSKEW_{T+1}$ *and* $DUVOL_{T+1}$. $NCSKEW_{T+1}$ *is the negative skewness of firm-specific weekly returns in year* T+1. $DUVOL_{T+1}$ *is down-to-up volatility in* T+1*, which equals the log of the ratio of the standard deviations of down weeks' firm-specific returns to that of up weeks. The key independent variable is environmental information disclosure,* EID_T. *Columns (1) and (4) are regressed by all companies (*ALL*). Columns (2) and (5) are regressed by polluting companies (*EXP*). Columns (3) and (6) are regressed by nonpolluting companies (*CONT*). All continuous variables are winsorized at the 1 and 99% percentiles. T-statistics reported in parentheses are based on standard errors clustered by firm.*, **, and *** *represent significance at the 10, 5, and 1% levels, respectively.*

Overall, it can be seen that EID of polluting companies in China cannot reduce their stock price crash risk by reducing their stock price synchronization (*H2b*). This confirms that the selective disclosure of environmental information of China's polluting listed companies is useless.

Robustness Tests

In this section, we use the disclosure-scoring method to measure the EID quality of the listed companies for robustness test (Altuwaijri et al., 2004; Plumlee et al., 2015). The disclosure-scoring rules are as follows: one point for text description, two points for simple quantified information, and three points for detailed quantification. By identifying the contents of environmental information disclosure item by item, the environmental information disclosure score (*EIDS*) of the listed companies is further calculated.

Table 6 presents the impact of *EIDS* on the stock price crash risk, with $NCSKEW_{T+1}$ and $DUVOL_{T+1}$ as dependent variables, respectively. The results are similar to those in **Table 3**. For all companies [Columns (1) and (4)], the coefficients on *EIDS* are positive but not statistically significant at the 10% level. For polluting companies [Columns (2) and (5)], the coefficients on *EIDS* are positive, with the statistical significance at the 10% level. For nonpolluting companies [Columns (3) and (6)], the coefficients on *EID* are negative but not statistically significant at the 10% level. It is further confirmed that the environmental information disclosure of Chinese polluting enterprises will increase their stock price crash risk.

Companies are not forced to disclose environmental information in China, so there may be selective bias between companies that disclose environmental information and companies that do not. For this reason, we further adopt the PSM method for robustness test. The steps are as follows: first, whether a listed company discloses at least one piece of environmental information is taken as the selection variable, and the Probit model is used to calculate the possibility score of environmental information disclosure of the listed companies. Then, the experimental group and the control group are matched using the 1:1 proximity principle to obtain the final matching sample.

Table 7 presents the PSM test of EID on the stock price crash risk, with $NCSKEW_{T+1}$ and $DUVOL_{T+1}$ as dependent variables, respectively. The results are similar to those in **Table 3**. For all companies [Columns (1) and (4)], the coefficients on *EID* are positive but not statistically significant at the 10% level. For polluting companies [Columns (2) and (5)], the coefficients on *EID* are all positive, with statistical significance at the 1% level. For nonpolluting companies [Columns (3) and (6)], the

TABLE 7 | Robustness test of the PSM test.

	$NCSKEW_{T+1}$			$DUVOL_{T+1}$		
	All	**EXP**	**CON**	**All**	**EXP**	**CON**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
EID_T	0.0012	0.0055***	−0.0024	0.0013	0.0032**	−0.0001
	(0.736)	(2.662)	(−0.928)	(1.124)	(2.047)	(−0.084)
AR_T	0.1497**	0.0549	0.2224***	0.0837**	0.0380	0.1278**
	(2.535)	(0.587)	(2.908)	(2.091)	(0.644)	(2.433)
$SIGMA_T$	9.5539***	2.4948	15.1259***	5.5827***	1.5945	9.1812***
	(3.080)	(0.530)	(3.699)	(2.629)	(0.525)	(3.242)
$ABSDA_T$	0.0918	0.0428	0.0277	0.0644	−0.0057	0.0500
	(0.582)	(0.177)	(0.131)	(0.561)	(−0.032)	(0.330)
$SIZE_T$	−0.0413***	−0.0389**	−0.0442***	−0.0383***	−0.0308***	−0.0491***
	(−4.023)	(−2.446)	(−3.075)	(−5.199)	(−2.647)	(−4.771)
LEV_T	0.0151	0.0782	0.0458	−0.0068	0.0100	0.0542
	(0.172)	(0.531)	(0.390)	(−0.106)	(0.091)	(0.618)
ROA_T	0.5463**	0.3172	0.9721***	0.4646***	0.2582	0.7988***
	(2.280)	(0.965)	(2.702)	(2.764)	(1.163)	(3.112)
$BOARD_T$	−0.0018	−0.0102*	0.0061	−0.0023	−0.0083**	0.0029
	(−0.469)	(−1.827)	(1.120)	(−0.859)	(−2.107)	(0.762)
$ANALYS_T$	0.1260***	0.1006**	0.1335***	0.0590***	0.0693**	0.0448*
	(4.506)	(2.311)	(3.603)	(3.093)	(2.349)	(1.784)
C	−0.2645	−0.1201	−0.4244	0.1367	0.0445	0.2673
	(−0.958)	(−0.291)	(−1.108)	(0.719)	(0.153)	(1.004)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Province	Yes	Yes	Yes	Yes	Yes	Yes
N	3,735	1,586	2,149	3,735	1,586	2,149

This table presents regression results for the effect of environmental information disclosure. The dependent variables are $NCSKEW_{T+1}$ *and* $DUVOL_{T+1}$. $NCSKEW_{T+1}$ *is the negative skewness of firm-specific weekly returns in year* T+1. $DUVOL_{T+1}$ *is down-to-up volatility in* T+1*, which equals the log of the ratio of the standard deviations of down weeks' firm-specific returns to that of up weeks. The key independent variable is environmental information disclosure,* EID_T. *Columns (1) and (4) are regressed by all companies (*ALL*). Columns (2) and (5) are regressed by polluting companies (*EXP*). Columns (3) and (6) are regressed by nonpolluting companies (*CONT*). All continuous variables are winsorized at the 1 and 99% percentiles. T-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** represent significance at the 10, 5, and 1% levels, respectively.*

coefficients on *EID* are negative but not statistically significant at the 10% level. It is further confirmed that the environmental information disclosure of Chinese polluting enterprises will increase their stock price crash risk.

CONCLUSION AND IMPLICATIONS

Environmental information disclosure has become an important environmental regulation which requires companies to disclose complete environmental information so as to reduce information asymmetry. It is a key measure to improve the effectiveness of environmental governance. However, there is a selective space for enterprises to disclose their environmental information. The managers can choose to disclose the environmental contributions of a company and meanwhile hide the environmental threats. This study sheds some light on the effects of selective environmental information disclosure on the efficiency of China's stock market.

The study has drawn three main conclusions: first, the environmental information disclosed by China's polluting companies cannot reduce their stock price crash risk but instead increases it. Second, the environmental information disclosed by the polluting companies with high information efficiency, high inefficient investment, high degree of government control, and low degree of marketization is more likely to increase the risk of stock price crash. Third, the environmental information disclosed by China's polluting companies cannot reduce their stock price crash risk by reducing their stock price synchronicity.

These findings suggest that there is a need to reassess the regulation designs of environmental information disclosure in China. Inappropriate environmental information disclosure policies not only fail to deliver useful information to the market but may also be used by enterprises with ulterior motives to exaggerate their contribution to the environment (Altuwaijri et al., 2004). As a result, the allocation of resources in capital markets is distorted, and the risk of stock price crash is heightened.

For regulators, they should improve the regulation of environmental information disclosure, which will bring great external regulatory pressure to enterprises. Strengthening the effective implementation of environmental protection policies can force enterprises to disclose high-quality environmental information (Zhang et al., 2016a).

For the management, they should fulfill the responsibility of environmental protection and play their governance role of

environmental information disclosure. The board of directors and the legal committee shall strengthen their supervisory role in the disclosure of environmental information and enhance their consciousness in the disclosure of environmental information.

For investors, they should correctly evaluate the environmental information disclosure of enterprises and avoid overreacting to negative environmental information, which will hinder the disclosure of environmental threats by enterprises. The capital market should guide enterprises to correctly fulfill the responsibility of environmental information disclosure.

This article further reveals the consequences of selective environmental information disclosure by enterprises. Further research can be conducted on how to improve the quality of environmental information disclosure. For example, consider building effective environmental information disclosure policies to guide enterprises to disclose high-quality environmental information and reduce the discretionary power of enterprises to disclose selective environmental information.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/Supplementary Materials; further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

FX: methodology, visualization, and writing—original draft. QJ: software, data curation, and writing—original draft. MY: investigation, supervision, validation, and writing—review and editing.

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