

The Effect of Environmental Disclosure Regulation and Institutional Pressures on Firm Environmental Disclosure in China

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ABSTRACT

This study examines the effects of a heightened environmental disclosure regulation and institutional pressures on firms' environmental information disclosure (EID). Using samples of 5,376 and 5,243 Chinese listed firms for the periods 2018–2023 and 2021–2023, this study finds that heightened disclosure regulation can significantly improve firm EID. Normative pressure has a positive impact, and mimetic pressure has a negative impact on EID following the disclosure regulation. The normative pressure effect is more significant among non-state-owned firms and firms in the eastern region. This study contributes to the literature on disclosure regulation and institutional pressures by focusing on a heightened disclosure regulation. The findings provide empirical evidence to policymakers regarding regulatory strength, policymaking, and subsidies. They also offer suggestions to firms and stakeholders regarding stakeholder participation and opinions.

Keywords: Environmental disclosure; regulation; institutional pressure; China; institutional theory

INTRODUCTION

Environmental issues have gained increasing attention over the last half-century. As a policy tool in environmental protection, environmental disclosure regulations have been introduced by a growing number of countries to provide stakeholders with better access to monitor firms' performance by increasing disclosure transparency (Johnson 2011). Environmental information disclosure (EID) in China has gradually become normalised among listed firms since 2006 (Huang & Chen 2015). A series of initiatives have been taken to address environmental issues and make firms' environmental information more transparent. Launched by the Chinese Ministry of Ecology and Environment on 11 December 2021 and coming into effect on 8 February 2022, the Measures for the Administration of Legal Disclosure of Enterprise Environmental Information aim to standardise and mandate environmental reporting by specifying a range of more detailed disclosure requirements. This regulation can be viewed as a necessary step towards complete ESG reporting in China's future (Huld 2022). Moreover, it is also a heightened disclosure regulation. Unlike previous Chinese mandatory disclosure regulations that indicate a significant policy shift, this regulation imposes only more detailed requirements on EID in the areas of disclosure entities, disclosure content, time limits, disclosure management, supervision, disclosure methods, and disclosure format. Whether this heightened disclosure regulation affects firm EID remains unclear.

Numerous researchers have discussed the effects of environmental disclosure regulations on firms' EID. On the one hand, some studies provide corroborating evidence of improvements in EID following the implementation of environmental reporting regulations (Choy 2024; Frost 2007; Ioannou & Serafeim 2017; Li et al. 2016a; Mahadeo et al. 2011). On the other hand, other studies demonstrate the ineffectiveness of disclosure regulations in EID improvement (Bebbington et al. 2012; Cong et al. 2020; Larrinaga et al. 2002). However, much of the existing research focuses only on regulations that entail breakthrough changes rather than "heightened regulations" with minor changes (e.g., Mahadeo et al. 2011; Frost 2007; Ren et al. 2020). Furthermore, considerable literature demonstrates that institutional pressures positively impact EID (Mateo-Márquez et al. 2022; Tang et al. 2022; Wu & Memon 2022). According to DiMaggio and Powell (1983), there are three major types of institutional pressure, namely coercive pressure, mimetic pressure, and normative pressure. Coercive pressure arises from formal and informal pressures imposed on organizations, which are largely associated with political forces, rules and regulations. Normative pressure, associated with professionalization, emerges as organizations internalize norms and values embedded in their institutional environment. Mimetic pressure appears as firms respond to uncertainty by imitating organizations with more advanced practices. All three pressures can drive firms toward isomorphic behaviours. However, there remains a paucity of evidence on the effects of institutional pressures arising from heightened disclosure regulation.

To fill the above gaps, this study investigates the effect of heightened environmental disclosure regulation on firm EID. This study addresses the following issues. Can a heightened environmental disclosure regulation improve EID? Can institutional pressures (i.e., coercive, normative, and mimetic pressures) arising from heightened disclosure regulation improve EID? Specifically, the researchers use samples of all listed firms in China during the period 2018–2023 and 2021–2023. Fixed-effect ordinary least squares (OLS) models are used. Various robustness tests and heterogeneity analyses are also conducted. The findings show that a heightened disclosure regulation can significantly improve firm EID. Normative pressure has a positive impact, and mimetic pressure has a negative impact on EID following the disclosure regulation. The normative pressure effect is more significant among non-SOEs and eastern region firms.

This study makes contributions to research on environmental disclosure regulation and institutional pressures. First, this study enriches the literature on the effects of disclosure regulation by focusing on heightened regulation. This study

centres on the Measures for the Administration of Legal Disclosure of Enterprise Environmental Information, which has received little attention, as most studies testing the effects of mandatory disclosure in China have focused on milestone-type regulations. Second, this study extends research on institutional pressures by examining how they affect EID following heightened regulation, an area few studies have investigated. This study enhances the understanding that the effect of institutional pressures arising from heightened regulations may not be as significant as that of milestone-type regulations; on the contrary, mimetic pressure may have a negative impact. Further, this study shows differences in institutional pressure effects across state- and non-state-owned firms, as well as across eastern and non-eastern firms, indicating that firms of different types respond differently to heightened disclosure regulations. The findings help improve China's environmental disclosure mechanism and provide valuable suggestions for policymakers, firms, and stakeholders.

The remaining part of this paper proceeds as follows. This paper first gives a brief overview of the literature and research hypotheses in Section 2. Section 3 offers the research design. Section 4 displays the empirical analysis. Section 5 is the robustness test. Section 6 presents the heterogeneity analysis. Section 7 discusses the results, and Section 8 concludes the paper.

LITERATURE REVIEW AND HYPOTHESES

FIRM RESPONSES TO ENVIRONMENTAL REPORTING REGULATION

There has been controversy over the effect of mandatory environmental disclosure regulations on firm EID. Some studies have found a positive impact of mandatory environmental reporting regulation on EID enhancement. For example, Choy (2024) found that a tougher ESG reporting regulation enhances the quality of EID for Hong Kong-listed Chinese firms. Li et al. (2016) observed a significant increase in the quantity and quality of environmental reporting by Chinese listed nonferrous metal firms after the publication of an environmental disclosure guide in 2010. On the other hand, some studies find a weak effect of mandatory environmental disclosure regulations. For example, Larrinaga et al. (2002) and Bebbington et al. (2012) observed that although the number of firms disclosing environmental information increased after the passage of the environmental accounting regulation in Spain, the regulation has not led to full compliance. Cong et al. (2020) discovered that two U.S. mandatory disclosure regulations, which require firms to report impacts on greenhouse gas emissions and climate change, have no significant influence on improving firms' climate change disclosure quality.

Although these studies provide important insights into the association between environmental disclosure regulation and EID, most studies focus on regulations that bear breakthrough changes rather than "heightened regulations" with minor changes. Take China as an instance, most studies testing mandatory disclosure effects in China have focused on the 2008 Environmental Information Disclosure Measures (Chen et al. 2018; Ren et al. 2020; Situ et al. 2020), the 2010 Environmental Information Disclosure of Listed Companies Guide (Li et al. 2016b), the Twelfth Five-Year Plan (Li & Lu 2020), and the Eleventh Five-Year Plan (Huang & Chen 2015). The effect of heightened regulations needs further research (Choy 2024). Moreover, the conflicting findings call for further research in this area.

INSTITUTIONAL PRESSURES AND EID

Much of the literature examining the influence of institutional pressures shows a positive impact on firm EID. For example, Tang et al. (2022) and Wu and Memon (2022) found that institutional pressure can significantly improve the level of environmental and carbon information disclosure in China. Mateo-Márquez et al. (2022) tested firms in 12 countries that participated in the 2015 Carbon Disclosure Project. They found that firms are less likely to engage in greenwashing when a country's climate change regulatory environment is strict.

However, few studies have investigated the effects of institutional pressures arising from heightened disclosure regulation. Minor changes in regulations may exert less institutional pressure on firms than breakthrough regulations do. The minor change in the regulation itself and the little enhancement in regulatory strength may not be able to exert a strong coercive effect. Minor changes may not attract as much attention from stakeholders, thereby affecting the impact of normative pressure. Also, minor changes may not receive much emphasis in industries, resulting in a muted effect of mimetic pressure. Hence, how firms would respond to heightened disclosure regulation under institutional pressures remains to be further researched.

DEVELOPING HYPOTHESIS

This study employs legitimacy and institutional theories as its main theoretical framework. Legitimacy theory postulates that firms' actions are bound up with "social norms, values, beliefs, and definitions" (Suchman 1995). Firms are forced to demonstrate their legitimacy to society; otherwise, they may be deprived of the resources needed to survive and develop (Yang et al. 2021). Legitimacy theory overlaps with institutional theory in the institutional legitimacy perspective (Chen & Roberts 2010). Institutional theory views firms as "embedded in an institutional environment", in which firms are constrained by a set of implicit or explicit rules that lead to firms' isomorphism in organisational structure and behaviour (Colwell & Joshi 2013; DiMaggio & Powell 1983).

Environmental disclosure regulations compel firms to provide certain environmental information; otherwise, they face penalties for noncompliance (Berrone et al. 2013; Zhang et al. 2023), creating a mandatory pressure on firms. To obtain legitimacy, firms are expected to provide proactive, high-quality EID (Meng et al. 2013). Moreover, non-financial reporting is heavily influenced by political cost considerations in China due to the government's dominating economic influence (Lee et al. 2017; Li et al. 2015). The Chinese government strongly and positively influences firms' environmental reporting, particularly in their annual reports (Situ et al. 2020). Therefore, this study proposes the following hypothesis:

H₁ EID quality is likely to increase after the heightened disclosure regulation.

Coercive pressure is expected to increase after the disclosure regulation. Compliance with the regulation can be seen as a way for firms to legitimise their practice. Moreover, the responsibilities of environmental agencies are specified in the regulation, thereby increasing regulatory strength. To gain legitimacy and avoid penalties, firms may actively respond to regulations and improve their EID.

Normative pressure is expected to increase after the disclosure regulation. The more attention and scrutiny firms receive from the public and social organisations, the greater the normative pressure on them. With the introduction of the environmental disclosure policy, the public and non-governmental organisations (NGOs) have improved access to environmental information, a valuable tool for scrutinising firms' environmental behaviour (Johnson, 2011). The increased normative pressure forces firms in industries to raise disclosure standards and move toward professionalisation (DiMaggio & Powell 1983).

Mimetic pressure, which is primarily driven by uncertainty (DiMaggio & Powell 1983), may also increase after the disclosure regulation. When facing uncertainty, firms turn to competitors to imitate their successful behaviours, reducing the costs of exploration and minimising experimentation costs (Wang et al. 2018). This heightened disclosure regulation is likely to bring uncertainty and mimetic pressure to firms. However, despite the expectation of increased mimetic pressure, several factors suggest that its impact on EID quality may be counterproductive in the context of heightened regulations.

First, when industrial competition intensifies, firms experience greater difficulty obtaining resources from markets (Pan et al. 2020), thereby imposing greater pressure on them to legitimise themselves to secure the resources necessary for survival. To gain legitimacy following the disclosure regulation, firms in fiercely competitive industries may adopt a greenwashing strategy, using EID as a legitimacy tool (Mallin et al. 2013) and disclosing information more symbolically, without engaging in environmental activities.

Second, intense industrial competition may force firms to invest in high-return, non-environmental projects rather than prioritise environmental disclosure. The growth rate of the Chinese economy has further slowed down in 2020 (Liu et al. 2023). High industrial competition indicates high peer pressure and intense competition to survive. Profit is an essential factor for firms to survive, especially for firms in highly competitive industries. The perceived costliness of disclosure practices and uncertainty about long-term benefits may discourage firms from investing resources in environmental disclosure (Wang et al. 2018).

Third, the heightened disclosure regulation may not receive as much attention from the government, society, and other stakeholders as breakthrough regulations do. If firms fail to improve EID, they may incur less loss than if they did not comply with a milestone-type regulation. In other words, the cost of being "non-legitimacy" is low. This low non-legitimacy cost motivates firms to select a greenwashing strategy or invest even more in high-return, non-environmental projects.

Therefore, this study proposes the following hypotheses:

- H₂ Firms are likely to improve their EID as coercive pressure increases following the heightened disclosure regulation.
- H₃ Firms are likely to improve their EID as normative pressure increases following the heightened disclosure regulation.
- H₄ Firms are likely to worsen their EID as mimetic pressure increases following the heightened disclosure regulation.

METHODOLOGY

SAMPLE AND DATA

The initial sample for this study comprised all firms listed on the A-share markets of the Shanghai and Shenzhen Stock Exchanges. First, the researchers collected data from 2018 to 2023 to examine variation in EID following the regulation, with the sample period covering the periods before and after the regulation's release. A final sample of 25,427 firm-years from 5,376 firms was obtained. Second, the researchers used data from 2021 to 2023 to examine the effect of institutional pressures on EID. The final sample comprised 5,243 firms and 14,295 observations.

The sample is screened in line with the following criteria: (1) excluding ST and *ST firms to ensure the stability and validity of the sample; (2) excluding listed financial firms because firms in the financial sector bear distinct characteristics from other firms and are subject to a separate disclosure requirement in China; (3) excluding firms with incomplete or missing data. All variables are winsorised to mitigate the potential impact of outliers.

VARIABLE MEASUREMENT

DEPENDENT VARIABLE

Environmental information disclosure (EID). Following the methodology of He et al. (2024), Shen et al. (2024), and Li et al. (2022), this study measures EID quality using scoring data from environmental disclosure items in the CSMAR database. A firm's EID is divided into five first-level indicators: environmental policies and management, environmental risks, environmental disclosure carrier, environmental liabilities, and environmental performance. The total score for EID is 42, with higher scores indicating higher-quality EID. The specific scoring criteria for EID quality are presented in Appendix A.

INDEPENDENT VARIABLE

The disclosure regulation. The disclosure regulation, which went into effect on 8 February 2022, states that “firms shall disclose environmental information for the period from 1 January to 31 December of the previous year before 15 March each year.” This implies that affected firms must provide environmental information for 2021 and beyond in accordance with the regulation. Following the methods used by Li and Lu (2020) and Richardson et al. (2012) to test the influence of a policy, this study creates a dummy variable based on the regulation's effective year. The variable is coded as follows: “1” for the post-regulation period (2021–2023), and “0” for the pre-regulation period (2018–2020).

Coercive pressure. Following Wang et al. (2022), the number of environmental administrative punishment cases by local governments is used as a measure of coercive pressure. A natural logarithm is taken for this measurement. It is based on the idea that firms are subject to greater regulatory oversight in provinces with more administrative inspections (Berrone et al. 2013). The data were collected from the Chinalawinfo Pkulaw Database.

Normative pressure. Based on Marquis et al. (2016), the normative pressure is measured by the number of NGOs. A natural logarithm is taken for the data. The data were collected from the Chinese National Bureau of Statistics.

Mimetic pressure. According to prior studies (Peng et al. 2015; Ren et al. 2021; H. Wang et al. 2023), mimetic pressure is measured by the Herfindahl-Hirschman Index (HHI), which is commonly used to assess the intensity of competition in industries. A natural logarithm is taken for the data. It was assumed that high competition indicated high mimetic pressure exerted on firms, and vice versa. The data were gathered from the CSMAR database.

CONTROL VARIABLES

The researchers control for five variables that may affect a firm's environmental disclosure. Profitability can positively impact EID (Abdullah et al. 2020). This study employs the natural logarithm of return on assets to measure a firm's profitability (Campello & Larrain 2016; Nicolo et al. 2023). Firm age is widely used as a control variable in studies of firm environmental responsibility (Meng et al. 2013; Ren et al. 2020; D. Sun et al. 2019) and is assumed to affect firm environmental activities. It is measured as the number of years since a firm's founding date (Wang et al. 2023). Firm size is another factor that impacts EID (Agyemang et al. 2021; Andrew & Baker 2020; Luft Mobus 2005; Park et al. 2023), and large-scale firms are more likely to exhibit good environmental performance (Tian & Lin 2019). The natural logarithm of a firm's total assets is used to measure a firm's size (Li & Lu 2020). Leverage may explain firm environmental disclosure practices (Clarkson et al. 2008). The researchers use the ratio of a firm's total debt to total assets to measure leverage (Chen et al. 2020; Clarkson et al. 2008). GDP per capita in a province is also controlled to reflect a province's economic development (Li & Lu 2020; Marquis & Qian 2014). More economically developed regions tend to have greater resources and capacity to invest in firm environmental responsibility activities. They may exert different pressures on firms following disclosure regulations with varying emphasis on social and environmental issues (Li & Lu 2020). A natural logarithm is taken for the GDP per capita. All the data were collected from the CSMAR database.

MODEL SPECIFICATION

First, in Equation (1), to examine variation in EID before and after the disclosure regulation, the researchers use a dummy variable and employ a firm-fixed-effects OLS with clustered (at the firm level) robust standard errors (Li & Lu 2020). Second, to explore the effect of institutional pressures on EID, fixed-effect OLS models with robust standard errors are employed to test the developed Hypotheses 2-4 (Equations 2-4). The models are constructed as follows:

$$EID_{it} = \beta_0 + \beta_1 Policy_{it} + \beta_2 X_{it} + \alpha_i + \varepsilon_{it} \quad (1)$$

$$EID_{it} = \beta_0 + \beta_3 CP_{it} + \beta_2 X_{it} + \varepsilon_{it} \quad (2)$$

$$EID_{it} = \beta_0 + \beta_3 NP_{it} + \beta_2 X_{it} + \varepsilon_{it} \quad (3)$$

$$EID_{it} = \beta_0 + \beta_3 MP_{it} + \beta_2 X_{it} + \varepsilon_{it} \quad (4)$$

where:

- i = the firm
- t = the year
- X_{it} = control variables
- a_i = firm-specific fixed effects
- ε_{it} = the error term
- Policy _{t} = the disclosure regulation
- CP = coercive pressure
- NP = normative pressure
- MP = mimetic pressure
- β_1 = the estimate on the impact of the disclosure regulation on EID
- β_3 = the estimates on the impacts of the institutional pressure variables on EID
- β_2 = the vector of estimates for control variables
- EID _{it} = the calculated score of a firm's EID.

RESULTS

DESCRIPTIVE STATISTICS

Descriptive statistics of variables are presented in Table 1. The EID score, which should range between 0 and 42 by default, has a minimum of 1 and a maximum of 31 in Sample 1 and 37 in Sample 2. The standard deviation is 7.737 in Sample 1 and 8.147 in Sample 2, indicating that firms' EID quality in the sample varies widely. The mean EID score is 10.33 in Sample 1 and 11.92 in Sample 2, suggesting relatively low environmental disclosure quality among the sample firms. For other variables of interest, descriptive statistics show a relatively wide range within each, providing valuable variation for hypothesis testing.

TABLE 1. Descriptive statistics

Variable	N	Mean	SD	Min	Max
Sample 1					
edis	25,427	10.33	7.737	1	31
policy	25,427	0.571	0.495	0	1
lroa	25,427	1.068	0.0183	1.029	1.099
firmage	25,427	20.85	6.048	8	37
lasset	25,427	22.24	1.193	20.47	24.78
leverage	25,427	0.409	0.204	0.0541	0.915
lgdpc	25,427	11.50	0.388	10.66	12.21
Sample 2					
edis	14,295	11.92	8.147	1	37
ladpen	14,295	7.957	1.025	5.505	9.319
lngo	14,295	10.58	0.722	8.757	11.40
lhhi	14,295	-2.451	0.633	-3.407	-1.019
lroa	14,295	0.820	0.0235	0.771	0.859
firmage	14,295	21.49	6.207	8	38
lasset	14,295	22.23	1.198	20.45	24.79
leverage	14,295	0.402	0.206	0.0510	0.916
lgdpc	14,295	11.58	0.370	10.62	12.21

CORRELATION ANALYSIS

The researchers conducted a correlation analysis for all variables. According to Pearson's correlation coefficients, disclosure regulation, coercive pressure, and mimetic pressure are statistically significantly correlated with total EID scores. Additionally, with all variance inflation factor values not exceeding 5, it can be concluded that multicollinearity is acceptable.

REGRESSION RESULTS

Table 2 reports the regression results for the study's four hypotheses. In Model 1, the coefficient for policy indicates that the EID score increases by 0.892 points ($\beta = 0.892, p < 0.01$) after the regulation, which is 8.63% above the mean EID score (10.33). Therefore, it supports the researchers' prediction that the disclosure regulation has a positive impact on EID. For Models 2 and 3, the coefficients for the independent variables indicate that coercive pressure ($\beta = 0.161, p < 0.1$) and normative pressure ($\beta = 0.440, p < 0.05$) are positively associated with EID. Therefore, it supports Hypotheses 2 and 3. For Model 4, the coefficient for mimetic pressure ($\beta = -1.406, p < 0.05$) indicates a negative impact on EID, consistent with Hypothesis 4.

TABLE 2. Regression results

	Model 1 EID	Model 2 EID	Model 3 EID	Model 4 EID
policy	0.892*** (0.094)			
ladpen		0.161* (0.051)		
lngo			0.440** (0.100)	
lhhi				-1.406** (0.192)
lroa	-0.919 (2.545)	44.440*** (4.352)	43.255*** (4.042)	43.801*** (3.968)
firmage	0.604*** (0.038)	-0.012 (0.006)	-0.012 (0.006)	-0.009 (0.007)
lasset	2.261*** (0.168)	3.111*** (0.300)	3.143*** (0.292)	3.151*** (0.316)
leverage	-1.965*** (0.468)	-2.076*** (0.203)	-2.175** (0.221)	-1.570** (0.232)
lgdpc	3.599*** (0.486)	-1.787*** (0.115)	-1.614*** (0.083)	-1.645*** (0.091)
Constant	-92.656*** (6.830)	-73.174*** (4.250)	-78.247*** (3.301)	-77.623*** (5.450)
N	25427	14295	14295	14295
R ²	0.254	0.221	0.223	0.233

Note: Robust standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

ROBUSTNESS CHECKS

ROBUSTNESS CHECKS FOR STEP ONE TEST (TESTING H1: REGULATION EFFECT)

HECKMAN CORRECTION FOR SAMPLE SELECTION BIAS

Listed firms are subject to current regulations requiring them to report environmental information. However, they are also under higher pressure to legitimise their highly polluting behaviour. These firms might use EID as an effective legitimising strategy (Meng et al. 2013). In that case, a self-selection bias may occur. A two-stage Heckman correction model is used to mitigate potential selection bias based on the full sample of 25,975 firm-year observations. A probit model is used, and provincial investments in urban environmental infrastructure construction (*invfra*) are included as an exclusive instrument. Government investment in environmental infrastructure can support firms' environmental activities by providing funding and promoting regional environmental development (Guo & Cui 2024), thereby imposing incentives and peer pressure on firms to report EID. The coefficient on the inverse Mills ratio is significant for EID, indicating the presence of sample selection bias. The effect of policy is consistent with the previous results in Table 2, which means the robustness of the study's findings for Hypothesis 1.

FORWARD DEPENDENT VARIABLE

A policy lag may delay the impact of environmental policy. A certain period is required for a policy to realise its effects from initial implementation (S. Yang et al. 2022). The researchers regressed environmental disclosure quality 1 year after the implementation of the disclosure regulation, using a sample from 2018 to 2022 with 19,884 firm-year observations. The results remain consistent with the original findings that support Hypothesis 1.

OMITTED VARIABLE BIAS

To control for as many variables as possible and reduce omitted-variable bias, the researchers further controlled for firm-level characteristics and corporate governance. They include the KZ index, the natural logarithm of a firm's fixed assets, CEO-Chairman duality, the proportion of independent directors, the proportion of shares held by the top shareholder, and government fiscal balance. The results remain consistent with the original findings.

ROBUSTNESS CHECKS FOR STEP TWO TEST (TESTING H2–H4: INSTITUTIONAL PRESSURE EFFECTS)

REPLACEMENT OF DEPENDENT VARIABLE

The researchers replaced the EID proxy variable with the Refinitiv environmental disclosure score. Prior researchers have used this measure to assess a firm's ESG disclosure performance (Nicolo et al. 2023). The environmental score was collected from the Refinitiv Datastream. The total Refinitiv environmental score is 100. The initial sample comprises 2,653 firm-year observations from 2021 to 2023.

The results are presented in Table 3. The results show that normative pressure is positively related to environmental disclosure scores ($\beta = 0.914$, $p < 0.05$), and mimetic pressure is negatively associated ($\beta = -3.804$, $p < 0.05$), further

supporting previous findings. However, no evidence has been found that the coercive pressure has a significant impact on the environmental disclosure scores ($\beta = 0.508, p \geq 0.1$).

TABLE 3. Regression results (robustness test on institutional pressure effect on Refinitiv environmental scores)

	Model 2	Model 3	Model 4
	envscore	envscore	envscore
ladpen	0.508 (0.194)		
lngo		0.914** (0.158)	
lhhi			-3.804** (0.722)
lroa	115.052** (11.757)	113.929** (11.966)	113.431** (13.463)
firmage	-0.241** (0.052)	-0.245** (0.051)	-0.241** (0.045)
lasset	11.449*** (0.139)	11.520*** (0.142)	11.898*** (0.144)
leverage	-2.774** (0.595)	-3.122** (0.628)	-2.065* (0.594)
lgdpc	0.729** (0.157)	1.317** (0.068)	1.111** (0.169)
Constant	-313.725*** (8.386)	-326.865*** (9.353)	-333.357*** (13.000)
<i>N</i>	2,653	2,653	2,653
<i>R</i> ²	0.285	0.286	0.296

Note: Robust standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The insignificant effect of coercive pressure when using Refinitiv scores may be attributed to differences in measurement approaches: Refinitiv scores emphasise disclosure comprehensiveness, while CSMAR scores capture China-specific regulatory compliance elements.

OMITTED VARIABLE BIAS

To control for as many variables as possible and reduce omitted-variable bias, this research further controlled for six firm-level characteristics and corporate governance variables. They include the KZ index, the natural logarithm of a firm's fixed assets, CEO-Chairman duality, the proportion of independent directors, the proportion of shares held by the top shareholder, and government fiscal balance. With the inclusion of these variables, the initial sample comprises 6,302 firm-year observations for 2021 to 2023. The results are consistent with previous findings and further support this study's hypotheses.

WEIGHTED LEAST SQUARES

First, the White test and the BP test (Breusch-Pagan test) were used to test for heteroscedasticity in the error term. The results suggest heteroscedasticity in these three models. Second, to address potential heteroscedasticity, the weighted least squares method was used to examine the impact of coercive pressure on environmental disclosure quality. The results show that normative pressure and mimetic pressure are respectively positively and negatively related to environmental disclosure scores; however, the coefficient for coercive pressure is insignificant.

HETEROGENEITY ANALYSIS

THE HETEROGENEITY ANALYSIS OF STATE OWNERSHIP

There is a controversy over the role of state ownership in firms' environmental responsibility activities. Some argued that state ownership is positively related to firms' environmental responsibility, environmental disclosure, and environmental performance (Acar et al. 2021; Ellen Pei-yi Yu et al. 2020; Ren et al. 2020; Q. Wang et al. 2022; Zhang 2017; Zhang et al. 2023). However, some studies failed to provide evidence of a positive relationship (Adomako & Nguyen 2020; Faisal et al. 2018).

A heterogeneity analysis was conducted to examine the effects of normative and mimetic pressures on EID. Table 4 displays the results. According to the table, normative pressure positively affects EID among non-SOEs ($\beta = 0.490, p < 0.05$), but has no significant effect on SOEs ($\beta = 0.326, p \geq 0.1$). It suggests that non-SOEs are more likely to improve their EID under the normative pressure. For the mimetic pressure, the coefficient is significantly and negatively related to EID for both state-owned ($\beta = -1.942, p < 0.01$) and non-state-owned firms ($\beta = -1.294, p < 0.05$). After conducting a variation test on the inter-group coefficients, it can be concluded that there is no statistically significant difference in the mimetic pressure effect between SOEs and non-SOEs.

These findings suggest that non-SOEs are more responsive to normative pressures, potentially because they depend more on external legitimacy and market-based resources than SOEs, which benefit from governmental support.

TABLE 4. Regression results on the institutional pressure effect (testing with the state-owned and non-state-owned firms)

	State-Owned Firms		Non-State-Owned Firms	
	edis		edis	
	(1)	(2)	(3)	(4)
Ingo	0.326 (0.220)		0.490** (0.075)	
lhhi		-1.942*** (0.033)		-1.294** (0.232)
lroa	28.038* (8.092)	27.356* (7.652)	45.604*** (3.253)	46.524*** (3.153)
firmage	-0.008 (0.020)	-0.004 (0.022)	-0.004 (0.003)	-0.002 (0.004)
lasset	2.953** (0.314)	2.958** (0.369)	3.135*** (0.274)	3.144*** (0.293)
leverage	-2.068* (0.615)	-1.334 (0.503)	-2.063*** (0.201)	-1.473** (0.218)
lgdpc	-1.392** (0.316)	-1.501* (0.370)	-1.676*** (0.056)	-1.689*** (0.053)
Constant	-62.404*** (3.894)	-62.448** (7.041)	-80.151*** (2.953)	-79.199*** (4.817)
N	2,488	2,488	11,807	11,807
R ²	0.199	0.220	0.226	0.234

Note: Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

THE HETEROGENEITY ANALYSIS OF THE REGION

Studies show that a firm's location influences its environmental disclosures (Bednárová et al. 2019; Doan & Sassen 2020). Firms located in eastern China tend to be more sensitive to environmental disclosure (Ding et al. 2022) due to unbalanced regional development and differences in regional legal environments (Tian & Lin 2019). The researchers thus segmented the sample by region. A firm is defined as an eastern-region firm if it is in eastern China; otherwise, as a western- or central-region firm.

Table 5 presents the results. According to the table, normative pressure positively affects EID for eastern-region firms ($\beta = 0.391, p < 0.05$), but has no significant effect on non-eastern-region firms ($\beta = 0.625, p \geq 0.1$). For the mimetic pressure, the coefficient is significantly and negatively related to EID for both eastern ($\beta = -1.192, p < 0.05$) and non-eastern region firms ($\beta = -1.853, p < 0.05$). After conducting a variation test, it can be concluded that there is no statistically significant difference between the two groups.

TABLE 5. Regression results on institutional pressure effect (testing with eastern region and non-eastern region firms)

	Eastern Region Firms		Non-Eastern Region Firms	
	edis		edis	
	(1)	(2)	(3)	(4)
Ingo	0.391** (0.052)		0.625 (0.248)	
lhhi		-1.192** (0.146)		-1.853** (0.305)
lroa	41.373*** (2.482)	41.546*** (2.356)	46.686** (9.212)	47.340** (8.409)
firmage	-0.021* (0.007)	-0.016 (0.008)	0.017 (0.007)	0.009 (0.007)
lasset	3.055*** (0.265)	3.066*** (0.282)	3.322** (0.363)	3.357** (0.380)
leverage	-1.201* (0.382)	-0.723 (0.366)	-4.592** (0.521)	-3.728** (0.430)
lgdpc	-1.642** (0.240)	-2.146** (0.319)	-1.651** (0.311)	-1.610*** (0.130)
Constant	-74.100*** (6.496)	-67.583** (8.695)	-86.125*** (2.154)	-86.242*** (3.925)
N	10,326	10,326	3,969	3,969
R ²	0.215	0.222	0.233	0.252

Note: Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0$

DISCUSSION

First, the results from Model 1 show that EID significantly improved after the regulation. This finding supports evidence from previous observations that mandatory environmental disclosure regulations have a real effect on environmental reporting quality (e.g., Choy 2024; Frost 2007; D. Li et al. 2016; Luft Mobus 2005).

Second, the main regression results show that coercive pressure positively affects EID. However, it fails two robustness tests. This result is contrary to previous research, which indicates a significantly positive relationship between coercive pressure and environmental disclosure (Mateo-Márquez et al. 2022; Wu & Memon 2022).

This inconsistency may be explained in part by the following reasons. (i) The leading affected firms, namely, heavy polluting listed firms, have remained essentially unchanged. Also, there are no breakthrough changes in disclosure requirements. Firms may already fulfil the requirements set by those previous regulations or may not need much effort to meet these new requirements. Hence, it may be difficult to expect a significant increase in EID, as firms may already be

“legal”. (ii) Other than the regulation itself, regulatory strength is another part of coercive pressure. In China, the effective implementation of environmental laws and regulations largely depends on local governments, primarily municipal governments (Wang et al. 2003). Strong government environmental regulation and strict government environmental oversight would positively impact EID (Wu & Memon, 2022). However, the government regulatory strength has largely remained the same after this disclosure regulation. Although the responsibility for implementation is stated in the regulation, no other significant policies have been imposed for strengthening government supervision of firm environmental disclosure. The lack of regulatory strength reinforcement may be another explanation for the limited improvement in EID quality (Amoako et al. 2021).

Third, the results reveal that normative pressure positively affects EID, underscoring the increasingly important role of NGOs in firm-level EID in China (Johnson 2011). This result aligns with earlier observations, which showed significant, positive effects of normative pressure on firm environmental responsibility practices (Amoako et al. 2021; Chaudhry & Amir 2020; Ning et al. 2022).

Fourth, the results show that mimetic pressure negatively affects EID, consistent with the researchers’ previous prediction. However, it disagrees with some earlier studies that have suggested a positive impact of mimetic pressure on firms’ environmental responsibility practices (Chaudhry & Amir 2020; Lee et al. 2022; Zhang et al. 2018). A possible explanation for this result is that high industrial competition may force firms to invest in high-return, non-environmental projects and engage in greenwashing, thereby reducing EID quality.

Fifth, the heterogeneity analysis of state ownership indicates that the normative pressure effect is more pronounced in non-SOEs. This result is in line with some studies that provided evidence of the positive association between non-SOEs and firm environmental performance and disclosure (Faisal et al. 2018; Z.R. Wang et al. 2023), while it disagrees with some studies that claim that SOEs are associated with better environmental disclosure quality and better environmental performance (Acar et al. 2021; Tian & Lin 2019). This result may be related to the little incentive for SOEs to engage in high-quality environmental disclosure. SOEs can obtain legitimacy and government resources more easily than their non-SOE counterparts if they comply with CSR laws (Marquis & Qian 2014; Zhang 2017). They are not in a strong need to compete for resources by performing extra CSR activities beyond the law. Therefore, they would not feel as pressured by NGOs as their non-SOE counterparts.

In contrast, the mimetic pressure effect remains the same across SOEs and non-SOEs. The reason for this result may be its ineffectiveness. Neither SOEs nor non-SOEs would face intense mimetic pressure to improve EID, since other firms in the same industry are unlikely to improve their environmental information.

Sixth, the heterogeneity analysis of the region shows that the normative pressure effect is more significant in eastern regions. This result might be explained by differences in green development across regions, where significant gaps exist in areas such as economic growth quality and pollution control (Yang et al. 2022). Also, firms located in eastern China tend to be more sensitive to environmental disclosure (Ding et al. 2022). Therefore, the normative pressure would have a larger impact on Eastern firms. However, the results show that the mimetic pressure effect remains unchanged across regions, which may be due to the ineffectiveness of mimetic pressure on EID.

CONCLUSION

This study explores the effects of a heightened environmental disclosure regulation and institutional pressures on EID quality. The results show that a heightened disclosure regulation can significantly improve firm EID. Normative pressure has a positive impact, while mimetic pressure has a negative impact on EID following the disclosure regulation. The normative pressure effect is more significant among non-SOEs and eastern region firms.

This study’s findings contribute to environmental disclosure research and extend legitimacy theory and institutional theory by showing that a heightened disclosure policy can impact firm EID through normative pressure. However, not all institutional pressures are effective. Specifically, it shows that the coercive pressure exerted by heightened disclosure policies may not be sufficient to motivate high-quality EID. Besides, under financial constraints and pressure to legitimise environmental practices, firms may prefer to survive (make a profit) or greenwash their environmental disclosures.

This study’s results generate several practical implications. First, government regulatory strength needs to be strengthened to exert more coercive pressure on firms to improve EID. Government oversight needs to be strengthened, and each department’s implementation responsibilities needs to be clarified. Second, the government needs to establish disclosure policies that entail more significant changes to effectively motivate EID improvement. Third, the government may need to offer more subsidies to firms in heavy-polluting industries. Firms may invest in high-return projects with insufficient financial resources, especially in emerging markets. Government subsidies could alleviate firms’ financial constraints to environmental projects. Fourth, stakeholders need to care about and actively participate in the firm’s environmental practices, as NGOs can positively influence the firm’s environmental activities. The communication between firms and stakeholders would exert pressure on firms to comply with environmental regulations and improve their EID (Johnson 2011). Fifth, at the firm level, firms should consider stakeholder opinions when developing environmental strategies.

This study also has limitations. First, this study only focuses on listed firms. Future studies should focus on small and medium-sized firms. Second, while this study explores the interplay between institutional pressures and disclosure policy,

firms' internal factors are not fully accounted for. Further work is needed to examine how firms' internal factors influence heightened environmental disclosure policy. Third, the study period encompasses the COVID-19 pandemic (2020-2023), which may have affected firms' resources available for environmental disclosure activities, potentially confounding the study's results. Fourth, although the researchers control for various firm characteristics, unobserved heterogeneity in firm-level environmental management capabilities may influence both responses to regulations and disclosure quality. Finally, this study focuses exclusively on the Chinese context; the findings may not be directly generalisable to other institutional environments with different regulatory traditions and enforcement mechanisms.

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APPENDIX A: Scoring criteria for environmental information disclosure quality

No.	Category	Disclosure items	Description	
1	Environmental policies and management (max score is 10)	Environmental philosophy		
2		Environmental objectives		
3		Environmental management system		
4		Environmental education and training		
5		Environmental special initiatives		
6		Environmental emergency response mechanism	Assigned 1 if present, otherwise 0.	
7		Environmental honours or awards		
8		"Three Simultaneous" System		
9		ISO 14001 certification		
10		ISO 9001 certification		
11	Environmental risks (max score is 5)	"Key pollution monitoring unit"		
12		Pollutant discharge standard		
13		Environmental accident	Assigned 1 if present, otherwise 0.	
14		Environmental violation		
15		Environmental petition letter cases		
16	Environmental disclosure carrier (max score is 3)	Annual report		
17		Corporate social responsibility (CSR) report	Assigned 1 if present, otherwise 0.	
18		Environmental report		
19	Environmental liabilities (max score is 12)	Discharge volume of wastewater		
20		Discharge volume of COD (chemical oxygen demand)		
21		Discharge volume of SO ₂ (sulfur dioxide)	No relevant information disclosed is assigned a value of 0, qualitative disclosure is assigned a value of 1, and quantitative disclosure is assigned a value of 2	
22		Discharge volume of CO ₂ (carbon dioxide)		
23		Emission volume of smoke and dust		
24		Generation volume of industrial solid waste		
25	Environmental performance (max score is 12)	Exhaust gas emission reduction		No relevant information disclosed is assigned a value of 0, qualitative disclosure is assigned a value of 1, and quantitative disclosure is assigned a value of 2
26		Wastewater emission reduction		
27		Dust and smoke governance		
28		Solid waste utilization and disposal		
29		Noise, light pollution, radiation and other		
30	Implementation of cleaner production			
Total score		42		

Data source: CSMAR database—Environmental Research Report