

Watchful Eye or Just a Veil? Common Institutional Ownership and Environmental Information Disclosure Quality

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Abstract: As an important channel for the external stakeholder to understand the environmental performance of enterprises, corporate environmental information disclosure is not only an effective way to exercise social supervision but also an important mechanism to promote corporate environmental governance. However, Under China's current environmental information disclosure model, irregular disclosures, ambiguity, and selective disclosure practices remain prevalent. Hence, it is crucial to seek solutions to improve the quality of environmental information disclosure. In recent years, the phenomenon of common institutional ownership has become increasingly widespread in the capital markets and has a significant impact on the strategic decisions of companies. This paper selects Chinese A-share listed firms from 2010-2021 as a research sample to examine the impact of common institutional ownership on the quality of environmental information disclosure. The study found that common institutional ownership can improve the quality of environmental information disclosure. The higher the degree of their linkage and the greater the shareholding, the more pronounced the synergistic effect. The findings remained valid after testing using propensity score matching (PSM) and changing the sample period. Heterogeneity analysis shows that the facilitating effect of common institutional ownership on the quality of environmental information disclosure is more pronounced in high-polluting firms and firms which stay in the growth and maturity stage. This paper enriches the research on the economic consequences of common institutional ownership in China and provides management implications for improving the environmental information disclosure system and promoting "genuine green" corporate social responsibility.

Keywords: Common institutional ownership, Environmental information disclosure, Greenwashing, Synergistic governance effect, Collusive fraud effect.

1. Introduction

In recent decades, environmental pollution is becoming a constraint on sustainable economic development, and stakeholders are increasingly concerned about environmental issues (Ahmad et al., 2019). As an essential part of non-financial information, environmental information can reflect the environmental management status of enterprises (Cormier & Magnan, 2015; Berrone et al., 2017). Environmental information disclosure is an important way for companies to signal their environmental responsibility and is an essential basis for stakeholders to measure environmental performance and optimize management decisions (Huang & Chen, 2015). On the one hand, the value of environmental information lies in its direct reflection of the environmental risks to which a company may be exposed, including physical environmental risks and the impairment of asset values arising from them. On the other hand, environmental information reflects the level of a company's management and the importance that management attaches to its stakeholders (Ahmad et al., 2019). In 2008, the Shanghai Stock Exchange issued the *Guidelines on Disclosure of Environmental Information of Listed Companies*, marking the beginning of the use of information disclosure policies by regulators to combat environmental pollution. Although the regulatory authorities have repeatedly emphasized and encouraged enterprises (especially highly polluting enterprises) to disclose environmental information, the overall disclosure of environmental information by enterprises in China still remains at the level of "compliance" and the initiative of disclosure is relatively low.

Still, as standards are not yet uniform, it is difficult for conventional administrative supervision to make a significant impact (Huang & Chen, 2015). Due to the low cost of non-compliance, environmental information disclosure policies are not as effective as they could be, and disclosure of unreasonable content and irregularities are common (Zou & Zhong, 2022). At present, there is still much room for improvement in the quality of environmental information disclosure, and the content of disclosure tends to be selective, especially the negative impact of pollutant emissions, related legal proceedings and possible contingent liabilities, etc (Zheng et al., 2020). On the whole, the situation of environmental information disclosure of listed companies in China is not optimistic: the disclosure of the information is formal, and the phenomenon of reporting good news but not bad is very prominent; some enterprises have disclosed environmental information, but the disclosure of key indicators is not in place, and a number of high-profile commitment of enterprises lack of practical action. Therefore, how to enhance the awareness of environmental information disclosure and improve the quality of environmental information disclosure has become a hot topic of research.

Since 2000, when the China Securities Regulatory Commission (CSRC) first proposed the "extraordinary development of institutional investors", the scale of institutional investors in China has expanded rapidly. In recent years, the phenomenon of institutional investors holding stakes in multiple firms in the same industry has gradually increased, which is referred to as "common institutional ownership" (He & Huang, 2017; Azar et al.,

2018). Common institutional ownership has led to increasing linkages between firms in the same industry and has significantly impacted micro-firm behaviour (Brooks et al., 2018). Compared to other shareholders and institutional investors, co-institutional investors act as “industry pivots” in the capital market and have an advantage regarding private information, management knowledge and industry experience (Chen et al., 2021). Moreover, co-institutional investors act as specialized majority shareholders, often with the aim of holding stakes in multiple companies (Gao et al., 2019). With the goal of enhancing portfolio value, co-institutional investors are more concerned about the economic consequences of major corporate decisions (Gao et al., 2019) and can exert substantial influence on corporate management and investment decisions by influencing the board of directors and management (Gilje et al., 2020; Koch et al., 2021). So, does the introduction of common institutional ownership have an impact on the quality of environmental information disclosure? Does it function as synergistic governance or collusive fraud?

Based on the review and discussion of the abovementioned important literature, this paper selects Chinese A-share listed firms from 2010-2021 as a research sample to study the impact of common institutional ownership on the quality of environmental information disclosure. The main contributions of this paper are as follows. First, this paper contributes to the study of how to effectively improve firms’ environmental information disclosure quality by identifying the common institutional ownership from the perspective of external governance mechanisms. In addition, this paper enriches the research on the economic consequences of common institutional ownership. Finally, this study may provide practical implications for policymakers to improve the environmental information disclosure system and promote the practice of “genuine green” environmental responsibility.

2. Hypothesis Development

As environmental performance has become an essential aspect of modern corporate legitimacy, companies use environmental disclosure for legitimacy management to build a green image, influence public perception of their environmental performance and improve their environmental legitimacy (Berrone et al., 2017; Tauscher & Rothe, 2021). Environmental disclosure gives organizations a way to maintain their legitimacy without having to change their economic model (Ahmad et al., 2019). Unlike other information, the diversity and complexity of environmental information provide management with greater disclosure discretion and room for manipulation (Huang & Chen, 2015). Meanwhile, the corporate governance role of common institutional ownership has attracted much attention from academics and industry in recent years. However, there is no unanimous conclusion on the corporate governance role of common institutional ownership, and there are mainly two types of views: “synergistic governance” and “collusive fraud”. Based on this, the paper argues that common institutional ownership may have a dual impact on the quality of environmental information disclosure and formulates the following competing hypotheses.

2.1. The synergistic governance effect of common institutional ownership

As an essential way of communicating information to the public, environmental information disclosure has become an effective means for enterprises to maintain the legitimacy of their organizations (Bansal & Clelland, 2004). From the perspective of signalling theory, well-governed companies place greater emphasis on the impact of environmental disclosure on value enhancement and the timely meeting stakeholders’ environmental demands (Boiral et al., 2018). Co-institutional investors hold equity for the long term and are more concerned about the strategic decisions and economic consequences of the companies they are linked to (Koch et al., 2021). As a result, co-institutional investors tend to be more forward-thinking in strategy, have a higher risk-taking capacity, and have longer-term investment horizons (Schmalz, 2018; Ramalingegowda et al., 2020). Hence, the introduction of common institutional ownership and a diversified shareholding structure will not only increase the incentive for shareholders to participate in monitoring but will also provide a suitable mechanism for monitoring and checking the manipulation of environmental information disclosure by major shareholders, thus promoting the practice of “genuine green” corporate social responsibility. Moreover, companies engaging in manipulating environmental information disclosure can leave green social responsibility in an ineffective lockstep for a long time (Santamaria et al., 2021). In the long run, this is detrimental to the company’s ability to increase its core competencies and corporate value and indirectly harms the interests of co-institutional investors. In this case, the co-institutional investor plays a supervisory role in the long-term health of the company to ask enterprises to disclose environmental information timely and accurately.

Besides, compared to individual institutional investors, co-institutional investors have a greater incentive and ability to monitor and govern the companies within their portfolio and to professionalize the corporate governance structure (Gao et al., 2019). In particular, co-institutional investors can effectively curb executives’ short-sighted and self-interested tendencies and reduce agency costs between shareholders and executives (Koch et al., 2021), enhancing the active and truthful disclosure of environmental information and the fulfilment of environmental social responsibility by executives. Furthermore, co-institutional investors have an advantage over ordinary institutional investors in terms of private information, management knowledge and industry experience. They can play a more vital external oversight role, exerting substantial influence on corporate environmental management and investment decisions through the board of directors (Ramalingegowda et al., 2020). Voting against and the threat of exit are effective means of monitoring governance by co-institutional investors, which means that co-institutional investors can consider the negative externalities of poor governance on other companies in the portfolio (Schmalz, 2018), as is the case of “environmental information greenwashing”. In summary, common institutional ownership could strengthen corporate oversight and governance, effectively mitigating agency conflicts between shareholders and executives and reducing the probability of manipulating environmental information disclosure. Accordingly, this paper proposes the following hypothesis:

Hypothesis 1a: Common institutional ownership can

improve the quality of environmental information disclosure.

2.2. The collusive fraud effect of common institutional ownership

Environmental protection and information disclosure can place severe constraints and costs on firms (Delgado-Marquez et al., 2017; Luo & Wang, 2021). Environmental disclosure imposes additional monitoring and reputational costs on companies, and the commitment made by high-quality disclosure forces companies to consider the consistency of future strategies with existing commitments, thus increasing the opportunity cost of future strategic adjustments. However, in the case of environmental information greenwashing, firms could ostensibly shoulder environmental responsibility and meet the public's demand for environmental protection without real money investment (Gray et al., 2020). Besides, it is typical for firms to manipulate environmental information by adopting the vague language and non-quantitative descriptions to gloss over their nonfeasance in assuming environmental responsibility and poor environmental performance (Mbanyele & Wang, 2022). Even though the quantity of environmental information disclosed may be high, the quality is significantly compromised (Yang et al., 2022). The preceding discussion is based on shareholder activism, i.e., co-institutional investors use their industry-specific strengths to improve corporate governance actively. However, because of the profit-seeking nature of capital, co-institutional investors naturally act with an eye to those who affect their interests. This means that the governance effects of co-institutional investors may not always be effective and positive.

For example, institutional investors may hold multiple companies in the same industry for risk diversification or frequent trading and have no incentive to participate actively in governance. In this case, co-institutional investors are "profit-seeking" and aim to maximize the value of their short-term gains (Azar et al., 2018). In addition, co-institutional investors may find it difficult to effectively monitor the board

of directors and management's collusion of interests due to their low shareholding. Still, they may instead coincide with the preference of professional managers to pursue the benefits of manipulating environmental information, resulting in only theoretical supervision of corporate environmental information disclosure. Companies are naturally inert in environmental governance and need external pressure to take practical action (Kim et al., 2021; Nardi, 2022). However, suppose the regulatory environment is lax or external force is insufficient. In that case, it is challenging to meet the institutional requirements for ethical restraint and the fulfilment of environmental responsibility. This provides sufficient conditions for companies to develop the incentive to greenwash environmental information, thus reducing the quality of environmental information disclosure.

Furthermore, co-institutional investors have the incentive and ability to lead the creation of "collusive alliances" (Azar et al., 2018), where the need to profit from information advantages may replace the need for high-quality environmental information, which in turn may create information barriers between companies held in the same industry (Ramalingegowda et al., 2020). Due to the difficulty of verifiable environmental information, management has greater room for selective disclosure. In this case, common institutional ownership can drive companies to hide accurate environmental information, resulting in information asymmetry in the industry. As a result, co-institutional investors may ignore the interests of the enterprise out of the cost-benefit principle. When the benefits of collusion with controlling shareholders and management outweigh the monitoring costs, co-institutional investors may set up information barriers to controlling shareholders and management to expand their business empires out of their interest maximization (Kang et al., 2018), thus exacerbating firms' "environmental information greenwashing". Accordingly, this paper proposes the following hypothesis:

Hypothesis 1b: Common institutional ownership can reduce the quality of environmental information disclosure.

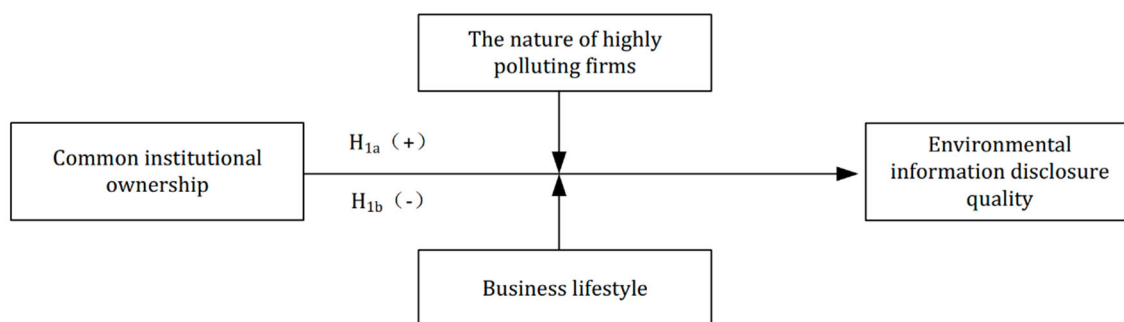


Figure 1. Conceptual framework

3. Methodology

3.1. Sample and data collection

To examine the hypotheses above, we selected Chinese-listed firms on the Shanghai and Shenzhen Stock Exchanges from 2010 to 2021 as the research sample. The reason for choosing 2010 as the initial year is that, in 2010, the Ministry of Environmental Protection of China issued the *Guidelines for Disclosure of Environmental Information of Listed*

Companies, which stipulates that listed firms should disclose environmental information to the public in an accurate, timely and complete manner. We ended our research period in 2021 because it was the most recent data we could obtain when we started this study. We collected the data mainly from the Chinese Securities Market and Accounting Research (CSMAR) database, which provides detailed financial data and has been widely used in other relevant studies (Zheng et al., 2020; Zhao & Chen, 2022). The data used to calculate the quality of environmental information disclosure was derived

from the China Listed Firm's Environmental Research Database of CMSAR. Common institutional ownership data was obtained manually from the CSMAR database at the corporate governance quarterly level; all other data were obtained from the CSMAR database.

Considering the financial industry's unique characteristics and data reliability, we excluded firms from the financial industry sector. All continuous variables were winsorized at the 1st and 99th percentiles to alleviate the effect of extreme values on the empirical results. Besides, we excluded the firms with the "special treatment" label and newly listed firms to make the data more reliable. After eliminating the samples with missing values, we finally obtained unbalanced panel data with 12634 firm-year observations.

3.2. Measures

3.2.1. Dependent variable

The dependent variable in this paper is *the quality of environmental information disclosure* (EID). As an essential aspect of social responsibility information disclosure, environmental information disclosure is receiving increasing attention from enterprises and society (Wellalage & Kumar, 2021; Zou & Zhong, 2022). Environmental information disclosure refers to the provision of environmental information and financial information related to the environment by enterprises, thereby satisfying the relevant needs of investors and regulators. Environmental information usually includes an enterprise's environmental policy, management, performance, investment, expenditure and revenue, etc.

According to the China Listed Firm's Environmental Research Database of CMSAR, we constructed an indicator system of environmental information disclosure based on 25 items in five dimensions: environmental management, environmental liabilities, environmental performance & governance, environmental information disclosure carriers and accreditation by independent agencies or external awards. Appendix 1 shows the indicator system of environmental information disclosure in all dimensions.

Quantitative monetary data is relatively objective and measurable and better reflects firms' input and cost of environmental management (Huang & Chen, 2015). According to Wang et al. (2021), if firms disclose more verifiable and less imitable information through quantitative descriptions and factual statements, their environmental information disclosures are more reliable and could be classified as substantive actions. In this paper, we adopt the content scoring method to measure the quality of environmental information disclosure of firms (EID). Indicators with no disclosure are assigned a value of 0, those with qualitative disclosure are assigned a value of 1, and those with quantitative disclosure are assigned a value of 2. The maximum score for all dimensions of environmental information disclosure shown in Appendix 1 is 37, with 12 quantitative items on environmental liabilities and environmental performance & governance and 13 qualitative items on the other three dimensions.

3.2.2. Independent variable

The independent variable in this paper is *common institutional ownership* (Coz). Referring to the existing literature (He and Huang, 2017; Chen et al., 2021), this paper constructs indicators from three dimensions:

(1) A common institutional ownership dummy variable (Coz), if there is a co-institutional investor in the year

holdings in the listed company, Coz1 is 1; otherwise, it is 0, where co-institutional investors are those who hold shares in two or more companies in the same industry both institutional investors holding not less than 5% of shares in two or more companies in the same industry.

(2) The degree of common institutional ownership linkage (Coz2) indicates the number of common institutional investors that collectively own the listed company, plus one to take the natural logarithm.

(3) Common institutional ownership shareholding (Coz3) equals the sum of the shareholdings of all co-institutional investors owned by a listed company during the year.

During the calculations, the independent variables are constructed based on quarterly data. Suppose a co-institutional investor holds a firm in any quarter of a year. In that case, the firm is judged to have common institutional ownership during the year. The average value of the quarterly indicators is taken as the corresponding annual indicator data.

3.2.3. Control variables

Referring to existing research on common institutional ownership and environmental information disclosure (Huang & Chen, 2015; He & Huang, 2017; Wang et al., 2021), several following control variables were considered in this paper. First, the size of a firm is a fundamental factor influencing strategic decisions and a significant source of firm heterogeneity. We controlled the firm size (*Size*) and measured it as the natural logarithm of its total assets. Besides, we controlled the firm age (*Age*) and measured it as the natural logarithm of the years a firm has existed since its foundation. Then, as mentioned above, financial factors are essential antecedents that impact firms' environmental information disclosure. We controlled three main financial indicators of the firm. Asset-liability ratio (*Lev*) was measured as the total liabilities at the end of the year divided by total assets at the end of the year. We controlled return on assets (*ROA*) and measured it as net profit divided by the average balance of total assets. The cash return on assets ratio (*Cashflow*) was calculated as the operating cash flow divided by total assets.

Besides, stakeholders inside and outside the firm play essential roles in corporate governance and are likely to influence firms' environmental information disclosure. Hence, we took the following control variables into account. We controlled the proportion of independent directors (*Indep*) and measured it as the number of independent directors divided by the number of directors. CEO Duality (*Dual*), which was a dummy variable and "1" indicated the chairman and managing director are the same person, "0" otherwise. Big Four Accounting Firms (*Big4*), which was also a dummy variable and "1" indicated the firm was audited by one of the Big Four accounting firms (PwC, Deloitte, KPMG, Ernst & Young), "0" otherwise. Management shareholding (*Mshare*) was calculated as the shareholdings of management divided by total share capital. Ownership Concentration (*Top1*) was measured as shares held by the top shareholder divided by the total shares. Finally, we controlled the year and industry dummy to account for unobserved factors influencing firms' environmental information disclosure.

3.3. Model specification

In this paper, we adopted fixed-effects ordinary least squares (OLS) estimation to control any potential time-invariant unobserved heterogeneity. We also controlled year and industry effects in our study to exclude the possible

effects of time factors and industry characteristics. Finally, we constructed the following regression model to examine the relationship between common institutional ownership and the quality of environmental information disclosure (EID), where the subscript i represented the firm, t represented the year, and ε represented the residual:

$$EID_{i,t} = \beta_0 + \beta_1 Coz_{i,t} + \beta_2 \Sigma Controls_{i,t} + \Sigma Year + \Sigma Industry + \varepsilon_{i,t} \quad (1)$$

4. Results

4.1. Descriptive statistics and correlation analysis

Table 1 presents the descriptive statistics of all variables.

For each variable, we report the number of firm-year observations, mean, standard deviation, minimum value and maximum value. As shown in Table 1, the mean value of *EID* is 5.626, and the standard deviation is 5.717, indicating that at present, the quality of environmental information disclosure by listed enterprises in China is still relatively low in general, and the disclosure status varies greatly between different enterprises, and the practice of environmental information disclosure is still at a relatively early stage of development in general. The mean of *Coz* is 0.039, indicating that the proportion of sample firms with common institutional ownership is less than 4%. Besides, the descriptive statistics of control variables are within a reasonable range, implying that outliers are unlikely to be a severe problem in this paper.

Table 1. Descriptive statistics

	Observations	Mean	SD	Min	Max
1.EID	12634	5.626	5.717	1.000	36.000
2.CoZ	12634	0.039	0.193	0.000	1.000
3.Size	12634	21.820	1.078	19.525	26.398
4.Age	12634	2.802	0.354	1.099	3.555
5.Lev	12634	0.370	0.191	0.027	0.925
6.ROA	12634	0.051	0.067	-0.398	0.244
7.Cashflow	12634	0.047	0.069	-0.224	0.257
8.Indep	12634	0.377	0.052	0.273	0.600
9.Dual	12634	0.380	0.485	0.000	1.000
10.Big4	12634	0.026	0.160	0.000	1.000
11.Mshare	12634	0.224	0.218	0.000	0.706
12.Top1	12634	0.325	0.136	0.083	0.758

Table 2 shows the Pearson correlation coefficient matrix for the main variables examined in this paper. The maximum correlation coefficient is 0.51, indicating the multicollinearity

problem between the variables is not severe, and the regression analysis can be further conducted.

Table 2. Correlation analysis

	1	2	3	4	5	6	7	8	9	10	11	12
1.EID	1.00											
2.CoZ	0.10***	1.00										
3.Size	0.29***	0.10***	1.00									
4.Age	0.12***	0.04***	0.19***	1.00								
5.Lev	0.08***	0.02***	0.51***	0.17***	1.00							
6.ROA	0.07***	0.03***	-0.02**	-0.10***	-0.34***	1.00						
7.Cashflow	0.16***	0.05***	0.05***	0.04***	-0.16***	0.37***	1.00					
8.Indep	-0.05***	0.01	-0.05***	0.02**	-0.02**	-0.01	0.00	1.00				
9.Dual	-0.07***	0.01	-0.11***	-0.07***	-0.08***	0.04***	-0.00	0.11***	1.00			
10.Big4	0.10***	0.09***	0.23***	0.03***	0.07***	0.03***	0.06***	0.01	-0.01	1.00		
11.Mshare	-0.11***	-0.08***	-0.32***	-0.21***	-0.28***	0.18***	0.01	0.07***	0.15***	-0.07***	1.00	
12.Top1	0.00	-0.04***	0.04***	-0.10***	-0.01	0.16***	0.08***	0.04***	0.05***	0.06***	0.03***	1.00

Note: This table reports the Pearson correlation metrics; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

4.2. Regression results

In this paper, we adopted fixed-effects ordinary least squares (OLS) estimation to control any potential time-invariant unobserved heterogeneity. We also controlled year and industry effects in our study to exclude the possible effects of time factors and industry characteristics.

Table 3 displays the fixed-effects OLS regression results. Model 1 is the baseline model that includes all the control

variables. Model 2 examines the relationship between common institutional ownership and the quality of environmental information disclosure. The coefficient of *Coz* is significantly positive ($\beta = 1.308$, $p < .01$), indicating a positive relationship between the common institutional ownership and the quality of environmental information disclosure. In other words, common institutional ownership can improve the quality of environmental information disclosure, supporting Hypothesis 1a.

Table 3. Regression analysis

Variables	Model 1 EID	Model 2 EID
Size	1.472*** (17.09)	1.452*** (19.16)
Age	0.347 (1.63)	0.339* (1.64)
Lev	-0.060 (-0.21)	-0.037 (-0.14)
ROA	2.762*** (4.42)	2.630*** (4.44)
Cashflow	5.630*** (11.16)	5.568*** (10.62)
Indep	-2.940*** (-3.55)	-3.015*** (-3.45)
Dual	-0.470*** (-10.13)	-0.483*** (-10.26)
Big4	1.418*** (6.19)	1.310*** (4.91)
Mshare	-0.629* (-1.72)	-0.555 (-1.59)
Top1	-1.122 (-1.27)	-1.029 (-1.14)
Coz		1.308*** (4.45)
Constant	-28.138*** (-15.24)	-27.695*** (-17.30)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Adjusted-R ²	0.233	0.235
Observations	12634	12634

Note: t-statistics in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1

Table 4. Robustness test: Propensity score matching

Variables	Model 1 EID
Size	1.756*** (10.19)
Age	0.109 (0.43)
Lev	-0.610 (-0.84)
ROA	-0.856 (-0.70)
Cashflow	7.571*** (7.87)
Indep	-6.868*** (-4.50)
Dual	-0.588** (-2.42)
Big4	1.353*** (3.96)
Mshare	-0.384 (-0.98)
Top1	-2.162*** (4.53)
Coz	1.314*** (4.31)
Constant	-31.255*** (-8.39)
Year FE	Yes
Industry FE	Yes
Adjusted-R ²	0.276
Observations	2504

Note: t-statistics in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1

4.3. Robustness tests

4.3.1. Propensity score matching

Considering that sample selection bias may bring about endogeneity problems, this paper adopts the propensity score matching method for correction. Propensity score matching (PSM) is a common method to mitigate the endogeneity problem caused by omitted variables and sample selection bias. Drawing on existing research, we adopt the one-to-one nearest neighbour matching method and select a series of control variables mentioned above as matching variables to find the control group with similar characteristics to the treatment group. In this paper, firms with common institutional ownership are used as the treatment group, and firms without common institutional ownership are used as the

control group.

First, we draw propensity score density plots before and after matching to test whether the treatment and control group satisfy the common support assumption. As shown in Figures 1 and 2, propensity score matching well eliminates the bias in the propensity score distribution between the two groups, allowing them to meet the common support assumption. Second, the regression results after propensity score matching are presented in Table 4. In Model 1, the coefficient of *Coz* is significantly positive ($\beta = 1.314, p < .01$), indicating a positive relationship between the common institutional ownership and the quality of environmental information disclosure. The result remains highly consistent with the empirical results above and supports Hypothesis 1a of this paper.

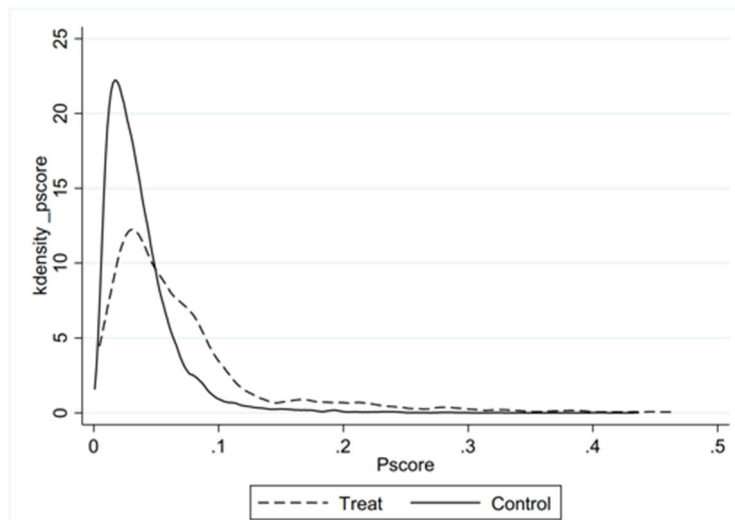


Figure 2. Density plot before matching

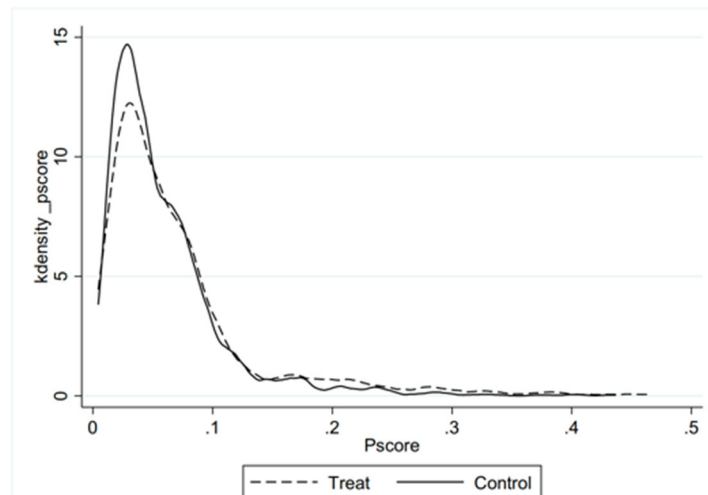


Figure 3. Density plot after matching

4.3.2. Adjust the sample for continuous panel data

While only retaining samples with more than three consecutive years of observations could reduce 761 firm-year observations, multiple years of consecutive observations would better reflect trends in the quality of environmental information disclosure and make the sample more representative over the time series. As shown in Table 5, the

coefficient of *Coz* in Model 2 is significantly positive ($\beta = 1.253, p < .01$), indicating a positive relationship between the common institutional ownership and the quality of environmental information disclosure. To sum up, the findings of this paper are not affected by changes in the research period and sample size and have a certain degree of robustness.

Table 5. Robustness test: Adjust the sample for continuous panel data

Variables	Model 1 EID	Model 2 EID
Size	1.459** (20.07)	1.441*** (22.61)
Age	0.388 (1.52)	0.383 (1.54)
Lev	0.167 (0.58)	0.187 (0.69)
ROA	3.149*** (4.38)	2.992*** (4.39)
Cashflow	5.782*** (11.77)	5.733*** (11.26)
Indep	-2.819*** (-3.22)	-2.899*** (-3.13)
Dual	-0.462*** (-9.20)	-0.474*** (-9.52)
Big4	1.339*** (3.47)	1.239*** (2.96)
Mshare	-0.538 (-1.62)	-0.467 (-1.48)
Top1	-1.304 (-1.54)	-1.221 (-1.42)
Coz		1.253*** (3.89)
Constant	-28.043*** (-18.22)	1.694*** (35.14)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Adjusted-R ²	0.229	0.231
Observations	11873	11873

Note: t-statistics in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1

Table 6. Further analysis

Variables	Model 1 EID	Model 1 EID
Size	1.453*** (19.11)	1.455*** (17.89)
Age	0.338* (1.64)	0.326 (1.60)
Lev	-0.037 (-0.14)	-0.030 (-0.11)
ROA	2.634*** (4.43)	2.696*** (4.46)
Cashflow	5.568*** (10.63)	5.594*** (10.83)
Indep	-3.018*** (-3.46)	-3.025*** (-3.44)
Dual	-0.482*** (-10.27)	-0.475*** (-10.12)
Big4	1.312*** (4.87)	1.314*** (4.97)
Mshare	-0.556 (-1.59)	-0.556* (-1.65)
Top1	-1.031 (-1.14)	-1.103 (-1.27)
Coz2	1.802*** (4.02)	
Coz3		5.979*** (2.91)
Constant	-27.708*** (-17.29)	-27.710*** (-16.26)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Adjusted-R ²	0.235	0.235
Observations	12634	12634

Note: t-statistics in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1

4.4. Further analysis

According to the theoretical analysis above, when co-institutional investors hold shares in multiple firms, they can improve communication among firms in the linked network and facilitate the exchange and sharing of information (Gao et al., 2019). As the shareholding ratio of common institutional ownership increases, its influence and voice in corporate governance will also be enhanced. This paper further examines the impact of the degree of linkage (*Coz2*) and shareholding (*Coz3*) of common institutional ownership on the quality of environmental information disclosure.

As shown in Table 6, the coefficient of *Coz2* in Model 1 is significantly positive ($\beta = 1.802, p < .01$). In Model 2, the coefficient of *Coz3* is also significantly positive ($\beta = 5.979, p < .01$). By further segmenting common institutional ownership, the paper finds that the higher the degree of common institutional ownership and the larger the shareholding, the more it helps to promote the quality of environmental information disclosure.

4.5. Heterogeneity analysis

As an informal system, the synergistic governance of common institutional ownership depends not only on the common institutional investors themselves but also influenced by the firms. Based on this, this paper further examines the nature of highly-polluting firms and business lifecycle on the effect of common institutional ownership on the quality of environmental information disclosure.

4.5.1. The nature of highly polluting firms

Polluting firms are those whose production activities have a significant negative impact on the environment. For

example, exposure to the air, agricultural activities and burning fossil fuels will cause air pollution. The government and market stakeholders are more likely to take notice of their strategic environmental practices (Zheng et al., 2020). Firstly, the definition of highly polluting firms is based on the *List of Listed Companies in the Environmental Protection Verification Industry Classification and Management* by the Ministry of Environmental Protection in 2008. Accordingly, this paper selected listed firms in highly polluting industries as the study sample.

As shown in Table 7, the coefficient of *Coz* in Model 1 is significantly positive ($\beta = 2.149, p < .01$). In Model 2, the coefficient of *Coz* is significantly positive ($\beta = 1.133, p < .1$). Compared to the non-highly polluting firms, the synergistic governance effect of common institutional ownership is more pronounced in highly-polluting firms.

Perhaps this is because the more stringent scrutiny standards and stricter environmental rules for highly polluting firms leave less potential for firms to manipulate environmental disclosures (Mbanye & Wang, 2022). In the context of strict environmental regulation, there is a higher probability of being spotted for engaging in “environmental information greenwashing”. Based on the cost-benefit principle, the increased intensity of environmental regulation could make highly polluting firms more pragmatic and cautious in disclosing environmental information so as not to draw wider attention or even regulatory intervention (Delgado-Marquez et al., 2017; Zheng et al., 2020). As such, common institutional ownership could better play the synergetic role and facilitate the quality of environmental information disclosure.

Table 7. Heterogeneity analysis

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
	The nature of highly polluting firms		Growth	Business lifecycle	
	highly polluting	Non-highly polluting		Mature	Decline
	EID	EID	EID	EID	EID
Size	1.651*** (13.35)	1.292*** (23.90)	1.436*** (11.76)	1.594*** (26.44)	1.247*** (10.41)
Age	-0.424 (-1.27)	0.502*** (3.45)	0.291 (1.46)	0.689* (1.89)	-0.114 (-0.32)
Lev	0.929 (1.32)	-0.260 (-0.84)	-0.309 (-0.97)	0.931 (1.63)	-0.681 (-1.06)
ROA	2.071 (1.00)	2.243*** (2.98)	1.182 (1.60)	4.014*** (4.28)	2.567* (1.81)
Cashflow	8.285*** (4.79)	4.404*** (6.22)	4.558*** (7.56)	3.946** (2.36)	6.090*** (3.95)
Indep	-8.162*** (-4.14)	0.220 (0.25)	-0.716 (-0.78)	-5.330*** (-4.25)	-4.503** (-2.36)
Dual	-0.931*** (-4.31)	-0.192** (-2.06)	-0.363*** (-3.60)	-0.653*** (-4.85)	-0.592*** (-2.75)
Big4	2.655*** (4.21)	0.590** (2.00)	2.527*** (6.77)	0.038 (0.09)	-0.718 (-0.95)
Mshare	-0.865* (-1.71)	-0.363 (-1.57)	-0.216 (-0.65)	-0.801* (-1.66)	-0.680 (-1.27)
Top1	-0.883 (-1.15)	-1.145*** (-3.35)	-1.055 (-1.26)	-0.822 (-0.83)	-1.205 (-1.51)
Coz	2.149*** (4.23)	1.133* (1.68)	0.909*** (4.19)	1.901*** (4.93)	0.660 (1.20)
Constant	-29.151*** (-9.67)	-25.074*** (-19.38)	-27.558*** (-10.85)	-31.744*** (-20.87)	-22.529*** (-7.46)
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Adjusted-R ²	0.203	0.207	0.214	0.215	0.211
Observations	3948	8803	6351	4126	2274

Note: t-statistics in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1

4.5.2. Business lifecycle

Firms are living organizations with a life cycle similar to that of an organism from birth to death (Koh et al., 2015; Zhao et al., 2023). Early research has found that, in addition to age, there are significant differences in size, profitability, investment strategy, willingness to innovate and research and development capabilities at different life cycle stages, as well as in the critical constraints on firm development. Referring to Koh et al. (2015) and other scholars, this paper uses four variables, namely sales revenue growth rate, retained earnings rate, capital expenditure rate, and firm age, to calculate a composite score to measure the life cycle of a firm, and classifies the different life cycles of a firm according to the criteria that about 1/4 of the highest scoring firms are growth stage firms, about 1/4 of the lowest scoring firms are decline stage firms, and the middle 1/2 are mature stage firms.

In Models 3 and 4, the coefficient of *Coz* is significantly positive ($\beta = 0.909, p < .01; \beta = 1.901, p < .01$), which means that compared to the decline stage firms, the synergistic governance effect of common institutional ownership is more pronounced in the growth stage and maturity stage firms.

Perhaps the reason for this is that during a period of decline, when the company's market share is shrinking, the resources available to it are diminishing, the organization is rigid, and the people within the company have meager expectations for the future and therefore have little interest in manipulating environmental information (Santamaria et al., 2021). However, during the growth and maturity stage of a company, the company is in the development stage and is still exposed to many external threats and uncertainties. The manipulation of environmental information disclosure by firms can give them environmental legitimacy and therefore increase environmental information greenwashing (Torelli et al., 2019; Shea & Hawn, 2019).

5. Conclusion and Discussion

5.1. Research conclusions

In recent years, environmental information has become an essential part of corporate information disclosure as the community has become increasingly concerned about environmental issues (Marquis et al., 2016; Long et al., 2022; Lee & Raschke, 2022). However, studies of Chinese companies have found that companies disclose environmental information selectively, specifically by reporting good news but not bad, focusing on qualitative information disclosure and neglecting quantitative information disclosure, and the overall quality is low (Huang & Chen, 2015; Zou & Zhong, 2022). At present, the disclosure of environmental information by Chinese companies relies heavily on the voluntary initiative of companies, and executives have discretionary power, which has led to environmental information disclosure becoming a strategic choice for executives (Zou & Zhong, 2022). Hence, it is crucial to seek solutions to improve the quality of environmental information disclosure. In recent years, the phenomenon of common institutional ownership has become increasingly widespread in the capital markets and has had a significant impact on the strategic decisions of companies. Using data from Chinese listed firms from 2010 to 2021, we empirically examine the positive relationship between common institutional ownership and the quality of environmental information disclosure. The study found that common institutional

ownership can improve the quality of environmental information disclosure. The higher the degree of their linkage and the greater the shareholding, the more pronounced the synergistic effect. The findings remained valid after testing using propensity score matching (PSM) and changing the sample period. Heterogeneity analysis shows that the facilitating effect of common institutional ownership on the quality of environmental information disclosure is more pronounced in high-polluting firms and firms which stay in the growth and maturity stage.

5.2. Theoretical contributions

Our study contributes to the existing research from the following aspects. First, this paper contributes to research on the quality of environmental information disclosure. Research on the factors influencing corporate environmental information disclosure has focused on formal institutional pressures, informal institutional constraints and stakeholder monitoring (Kim & Lyon, 2011; Huang et al., 2022). Scholars have generally argued that it is difficult for companies to avoid the influence of governmental pressure to disclose environmental information and that companies will choose to meet the regulatory requirements of governmental authorities and strive to improve the quality of environmental information disclosure to establish and maintain a level of legitimacy and avoid possible "political costs". Particularly in China, formal institutional pressures have not been strong in explaining the need for companies to improve the quality of their environmental disclosures (Zou & Zhong, 2022). Although environmental information disclosure has become an important aspect of a company's source of legitimacy, more and more companies are moving from a "resistant" to an "adaptive" attitude towards disclosing environmental information (Berrone et al., 2017). However, this is often seen as a typical "talkative" language strategy and "greenwash" impression management, seeking to achieve the lowest cost of environmental regulatory avoidance and green reputation building, which often results in lower quality environmental information disclosure (Amores-Salvado et al., 2022; Coen et al., 2022). Compared to developed countries, in China, the attention and research on corporate environmental information disclosure started later, and the relevant laws, regulations and policies and regulatory systems are less well developed (Huang & Chen, 2015). This paper seeks to contribute to the study of how to effectively improve the quality of environmental information disclosure by identifying the common institutional ownership from the perspective of external governance mechanisms.

Second, this paper enriches the research on the economic consequences of common institutional ownership. The corporate governance role of common institutional ownership has attracted much attention from academics and industry in recent years (Schmalz, 2018; Gao et al., 2019; Koch et al., 2021). However, there is no unanimous conclusion on the corporate governance role of common institutional ownership. There are two main types of views: "synergistic governance" and "collusive fraud": some studies suggest that common institutional ownership has synergistic governance effects and can improve M&A performance (Brooks et al., 2018), as well as curbing corporate surplus management (Ramalingegowda et al., 2020). Some studies have also taken the opposite view, arguing that common institutional ownership engages in collusive fraud with the firms it is linked to, distorting the

market price mechanism and making the market less competitive (Azar et al., 2018). We argue that the “collaborative governance” or “collusive fraud” effect of common institutional ownership may be related to the firm’s business activities, level of governance, and resource allocation. This paper finds that common institutional ownership can improve the quality of environmental information disclosure. Besides, the promoting effect of common institutional ownership on the quality of environmental information disclosure is more pronounced in high-polluting firms and firms that stay in the growth and maturity stage.

5.3. Practical implications

Firstly, the environmental information disclosure system should be improved. The realization of the green transformation requires firms to reduce or even eliminate greenwashing behaviour, improve the quality of environmental information disclosure and faithfully assume their environmental responsibility. In China, environmental information disclosure by firms is often a mere formality, and the phenomenon of reporting good news rather than bad is very prominent. Regarding environmental information disclosure, the most critical question is not what has been disclosed but what has not been disclosed and how truthful the disclosure is (Donia & Sirsly, 2016; Dahlmann et al., 2019). Although the current government regulators have formulated and released a version of the environmental information disclosure rules, the disclosure of environmental information by listed companies has its own autonomy and discretion and is not mandatory (Huang & Chen, 2015). At present, China is facing increasingly serious environmental protection problems, and enterprises, as essential pollution subjects, deserve more attention from the regulatory authorities (Zou & Zhong, 2022). Therefore, the authorities concerned should focus supervision on companies with false statements and inconsistencies in their environmental reports to prompt them to improve the quality of their environmental information disclosure. At the same time, the management of environmental information disclosure rules should be strengthened and deepened, requiring companies to enhance “hard” disclosure and reduce “soft” disclosure (Huang & Chen, 2015), especially to avoid vague and ambiguous environmental information language. In addition, environmental audits should be actively promoted to strengthen the supervision and audit of environmental information disclosed by enterprises and to prevent problems such as the falsification of environmental data.

Hence, the research findings could help policymakers find a solution to improve the quality of environmental information disclosure and drive the implementation of environmental responsibility towards a virtuous cycle. Asymmetry in environmental information disclosure creates a fertile ground for environmental information greenwashing (Kirchhoff, 2000; Lee & Raschke, 2022). Therefore, to squeeze the space for firms’ greenwashing behaviour and improve the quality of environmental information disclosure, the authorities concerned could reduce the degree of asymmetry by developing more scientific environmental information disclosure guidelines, raising the cost of non-compliance, and actively introducing third-party assurance mechanisms. In this case, the corporate governance role of common institutional ownership should be emphasized. Government regulators should encourage and guide co-institutional

investors to play a collaborative governance role, improve relevant policies and regulations to motivate co-institutional investors, enhance the depth and breadth of common institutional ownership in corporate management, and further leverage its unique advantages as an “industry pivot” and “information intermediary”.

5.4. Limitations and future research

Inevitably, there are some limitations to this paper which require further in-depth study in the future: (1) Based on the availability of data, this paper constructs the indicator of common institutional ownership through public data of listed firms without considering the case of common institutional shareholding of non-listed firms, and the construction of the indicator of common institutional ownership can be further improved in the future; (2) Our research context is limited to China, with relatively weak market-based institutions (Jamali & Karam, 2018). Hence, the conclusions in our study may not be universal and generalizable to other research contexts where the institutional environment is more well-developed (e.g., the United States, European countries, etc.). Future research could expand the sample to other research contexts and examine whether our findings will be variant in different research contexts; (3) This study is based on the statistical analysis of a large sample to investigate how common institutional ownership affects the quality of environmental information disclosure. In the future, we may consider using fuzzy set qualitative comparative analysis (fsQCA), rooting theory and other research methods to further study the relationship between common institutional ownership and the quality of environmental information disclosure in the context of specific industries or typical cases.

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflict of interest statement

None.

Appendix

Table 1. Indicator system of environmental information disclosure

Tier 1 indicators	Tier 2 indicators
Environmental Management	Environmental Concepts
	Environmental Goals
	Environmental Management System
	Environmental Education and Training
	Special Environmental Actions
	Environmental Emergency Response Mechanism
	“Three Simultaneity” System
	Wastewater Emission

Environmental liabilities	COD Emission
	SO ₂ Emission
	CO ₂ Emission
	Soot and Dust Emission
	Industrial Solid Waste Emission
Environmental performance and governance	Waste Gas Emission Reduction Treatment
	Wastewater Emission Reduction Treatment
	Soot and Dust Reduction Treatment
	Solid Waste Disposal and Utilization
	Noise, Light Pollution and Radiation Governance
	Cleaner Production Implementation
	Annual Reports of Listed firms
Environmental information disclosure carriers	Social Responsibility Reports
	Environmental Reports
	Accreditation by independent agencies or external awards
ISO14001 Certification	ISO9001 Certification
	Environmental Honors or Awards

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