Influence of green innovation on disclosure quality: Mediating role of media attention

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Abstract

The importance of green innovation has been underlined by the 26th United Nations Climate Change Conference (COP26). This study examines the data from Chinese listed companies for the years from 2003 to 2019 to investigate the effect of corporate green innovation behavior on information disclosure decisions, thereby clarifying how the outcomes of green innovation influence internal corporate decision-making. The results indicate that green innovation motivates companies to disclose high-quality information. In addition, after considering potential endogenous interferences and performing several robustness tests, this study obtains consistent results. It also reveals that media attention is a crucial mechanism that enables green innovation to enhance the quality of information disclosure. The effect of green innovation on disclosure quality also exhibits industry heterogeneity. Therefore, the guiding of media attention and policies on the basis of industry characteristics is also a key component in the development of green innovation.

Keywords: Green innovation, disclosure quality, media attention

JEL Classification: G32; G38

1. Introduction

As discussed in the 26th United Nations Climate Change Conference (COP26), people are increasingly aware that development at the cost of polluting the environment creates severe environmental problems. The necessity of green growth is increasingly urgent (Cunningham and Thissen, 2012; Gozgor, 2017; Rogge and Johnstone, 2017; Zhang et al., 2019). On December 12, 2015, 195 countries adopted the *Paris Agreement* (also known as the *Paris Climate Accord*) at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change to collaborate on building a sustainable planetary ecology. At the 26th Conference of the Parties (COP26), the attending parties finalized the implementation rules of the *Paris Agreement*, moving from concept and policy to implementation. As a party to the agreement, China proposed the “double carbon” goal in 2020 (i.e., achieving “carbon peaking” by 2030 and “carbon neutrality” by 2060). Incentivizing companies to make a green transition while ensuring that economic benefits are generated is an urgent challenge for developing countries that are rapidly industrializing, such as China (Gozgor and Can, 2017; Rogge and Schleich, 2018; Hu et al., 2021; Gozgor and Paramati, 2022; Wang et al., 2022; Sha, 2022).

Green innovation is recognized for its role in furthering sustainable development, and it is a fundamental force that drives the growth of green productive capacity (Yan et al., 2020). For example, converting energy systems to renewable energy systems requires accelerated technological change. However, green development is a long-term goal, and a company’s green innovation is influenced by its long-term emission reduction goals. According to neoclassical theory, any environmental improvement causes firms to absorb external costs and generate diminishing returns (Palmer et al., 1995; Gray and Shadbegian, 1998). Lanoie et al. (2011) argue that not all firms’ green innovations can fully offset the costs of environmental regulation. On the basis of the assumption that innovation leads to diminishing returns, corporate engagement in green innovation contradicts the goal of maximizing corporate profits. An in-depth exploration of the economic consequences of green innovation can contribute to the development of policies that improve the green transformation of firms and further incentivize them to engage in green innovation. The research on the effect of green innovation on environmental performance is extensive (e.g., Carrión-Flores and Innes, 2010; Singh et al., 2020; Lin and Ma, 2022). Some other papers focus on the positive consequences of green investments, for example, the contribution of green investments to sustainable economic growth (Gozgor, 2008) and green total factor productivity (Song et al., 2021). Unlike green investment, which is discussed from the perspective of inputs, this paper considers the economic consequences of the outcomes of direct innovation, dispensing with the discussion of the efficiency of transforming inputs into outcomes. Specifically, the present study considers how a company's green innovation affects its information disclosure rating (IDR). It also focuses on IDRs because of the information asymmetry between the internal and external stakeholders of a firm; when stakeholders realize that green innovation not only meets their green needs but is also associated with high-quality corporate disclosure, they pay increasing attention to firms that stand out in terms of green innovation, which further incentivizes firms to innovate green technology. The present study also explores the role played by an external mechanism, media attention, in this context.

The effect of green innovation on disclosure is difficult to estimate. On the one hand, the externalities of green innovations lead to diminishing returns (e.g., Palmer, 1995; Gray and Shadbegian, 1998; Lanoie et al., 2011). On the other hand, green innovations may also contribute to the core competencies of firms (e.g., Demailly and Quirion, 2008; Chang, 2011). Therefore, further research is required to clarify the specific link between green innovation and IDRs. The present study examines three topics. First, it explores how green innovation affects IDRs. Because a company endogenously determines both green innovation and disclosure decisions, the present study also uses models (e.g., the two-stage least squares [2SLS] model, the difference-in-difference [DID] model, and the generalized method of moments [GMM] system dynamic model) to mitigate endogenous interferences. Second, the present study examines the external mechanisms of media attention. Media attention has dual functions, namely information dissemination and external monitoring (Luo et al., 2022). Media attention not only helps companies to attract stakeholders who pay attention to green innovation but also improves the external monitoring of companies and creates positive feedback. Third, the present study examines heterogeneous effects across industries. This paper examines the Chinese sample because, on the one hand, green innovation in China is valued by companies and provides a large sample for analyzing the positive effects of green innovation. Figure 1 illustrates the evolution of the number of green patents in China, showing that both the number of green patents applied for and granted are growing rapidly. On the other hand, China, as one of the most talked about emerging economies, is actively seeking economic transformation and also needs to ensure economic development. A systematic study of the effect of green innovation on information disclosure can help government departments to formulate environmental and disclosure-related regulatory policies. It can also promote the reasonable use of media attention to improve corporate green innovation. The present study's results can serve as a reference for green innovation and green economic transformation in other countries.

[Insert Figure 1 around here]

The present study is an empirical study that addresses the three aforementioned topics. It makes the following contributions to the literature. First, empirical research on the economic consequences of green innovation is still limited. Although the effect of innovation is extensively studied, the dual externalities of green innovation, namely technological externalities and environmental externalities (Rennings et al., 2000; Roper et al., 2013; Xu et al., 2021), lead to the nongeneralizability of firms with respect to decision-making related to green innovation and information disclosure. To the best of the authors' knowledge, the present study is the first to investigate the effect of green innovation on IDRs. The empirical results indicate that green innovation enhances IDRs, which expands the relevant literature and the awareness of the positive consequences associated with green innovation. Second, the present study explores how green innovation affects corporate information disclosure decisions. Four proxy variables are used for media attention, and the results indicate that media attention plays a positive role. The present study points to additional factors to be considered for the positive role of green innovation in the green transformation. Specifically, the role of media attention should also be taken into account in promoting the development of green innovation for a more positive economic outcome. Third, the present study focuses on the heterogeneous effects of green innovation on the disclosure decisions of companies in various industries; an improved understanding of this topic contributes to the formulation of improved strategies for green development based on industry characteristics.

The remainder of this paper is structured as follows: Section 2 presents a review of the literature and presents the research hypotheses of the study; Section 3 describes the research methodology and data; Section 4 reports the results and analysis of the empirical study; and Section 5 concludes the study and presents the corresponding policy implications and research limitations.

2. Literature review and research hypothesis

Green innovation (environmental innovation or eco-innovation) is a subcategory of innovation (Wagner, 2008), and it has no common definition. Although the definition of green innovation varies in the literature, the academic consensus is that green innovation is based on environmental protection and is focused on the efficient use of resources, the improvement of ecological environments, and the promotion of ecological sustainability (e.g., Rennings, 2000; Brunnermeier and Cohen, 2003). For example, Chen et al. (2006) and Chen (2008) define green innovation as a type of hardware or software innovation that is related to green products or processes. Rennings (2000) also regards green innovations as innovations or improvements that are used to avoid or reduce environmental damage. Beise and Rennings (2003) suggest that green innovation may be motivated by environmental goals, business goals, or a combination of both. On the one hand, green innovation is a key driver for reducing emissions of toxic, polluting substances (Carrión-Flores and Innes, 2010); reducing energy intensity (Wurlod and Noailly, 2018); and promoting positive environmental performance (Rehman et al., 2021). On the other hand, green innovation can also have an economic effect on a company.

First, companies with green innovation as a competitive advantage outperform those without it, and these companies are more incentivized to disclose more and higher quality information. According to the resource-based view theory, sustained competitive advantage originates from firm-controlled resources and capabilities that are valuable, rare, imperfectly imitable, and nonsubstitutable (Barney, 1991; Barney et al., 2001). The extent to which a firm owns and manages such resources is correlated with its performance (Barney et al., 2001). Green innovation encourages the efficient use of materials and advocates increased resource productivity, which not only reduces the net cost required for a company to meet environmental regulations but can also transform products or related processes to create competitive advantages (Demailly and Quirion, 2008; Chang, 2011). Firms that engage in green innovation have a first-mover and pricing advantage, which allows them to demand higher prices for green products and explore new markets (Chen et al., 2006).

Second, green innovation benefits a company by helping it to build a positive image and meet the sustainable needs of its customers, which promotes corporate disclosure (Chen et al., 2006; Chen, 2008; Dangelico and Pujari, 2010). A positive reputation is also a type of market advantage that should increase the cash flow of a company (Eiadat et al., 2008). Consumers are increasingly concerned about the sustainability of products and their production processes. If a company does not meet the sustainable needs of its customers, it may experience a loss of market share, which leads to poorer financial performance (Gualandris and Kalchschmidt, 2014). Conversely, green innovation provides future benefits to companies through cost reductions (e.g., better use of raw materials) or increased consumer demand (Ben Arfi et al., 2018).

Finally, companies take all aspects of their performance into account when they make disclosure decisions. Companies determine how and what they should disclose on the basis of their financial situation (Hayes and Lundholm, 1996), and they tend to increase their information disclosure when their financial performance is favorable (Healy and Palepu, 2001). The disclosure of positive financial results and operating performance by a company causes earnings and share prices to be overvalued (Chen et al., 2001; Barton and Mercer, 2005), which can reduce its financing costs (Botosan, 1997) and provide an incentive for the company to disclose more information to the public. Firms with more favorable financial performance are less incentivized to whitewash their financial results; thus, they have higher IDRs.

On the basis of the aforementioned literature findings, the following hypothesis is proposed:

H1a: Companies with more green innovation have higher IDRs.

Nevertheless, several studies support the opposite view. First, according to neoclassical theory, environmental protection efforts lead to the internalization of external costs; this increases firm costs and reduces the size of an industry, which may have a negative effect on firm innovation and competitiveness (Walley and Whitehead, 1994). Palmer et al. (1995) also express a negative view; they argue that firms that engage in green innovation are inefficient and experience productivity losses. Thus, green innovation may not only fail to generate competitive advantages for a company but also harm its position. On the basis of this perspective, companies disclose less information. Second, an inherent conflict exists between environmental protection and corporate performance. When increasing demands are placed on firms to protect the natural environment, capital and labor costs increase, management attention is diverted, and productive investments are neglected (Christainsen and Tietenberge, 1985). Meanwhile, a general consensus has yet to be reached regarding the interpretation of how green innovation enhances corporate performance (Tang et al., 2018). If companies make disclosure decisions primarily on the basis of financial performance, the quality of their information disclosure may decrease substantially after they engage in green innovation. Finally, when a company's knowledge becomes public information, the company finds it difficult to exclusively enjoy the benefits of innovations resulting from co-investments involving competitors (Lanoie et al., 2011). Therefore, to protect their patents, companies reduce the quality of their information disclosure to prevent their competitors from imitating their products and services and to reduce the cost of disclosure and competition.

On the basis of the aforementioned discussion, the following hypothesis is proposed:

H1b: Companies with more green innovation have lower IDRs.

3. Method and data

3.1 Model specification

A panel two-way fixed effects model is applied to preliminarily study the direct effect of green innovation. The applied linear regression model is as follows:

$$IDR_{i,t} = constant + \beta * lnGreen_{i,t} + \gamma * control_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}, \quad (1)$$

where *i* represents the company, and *t* denotes the year. The core explanatory variable is $lnGreen_{i,t}$, which represents the logarithm of green technological innovation. Notably, the logarithm transformation of green innovation plus one is used to avoid generating missing values when the value of green innovation equals zero. Contemporary green innovation is selected as the explanatory variable because a firm's disclosure strategy can change instantaneously when it engages in green technological innovation. $IDR_{i,t}$ is the financial IDR of firm *i* in year *t*. $control_{i,t}$ denotes the control variables, which include firm characteristics such as size, leverage and rate of return. μ_i is the firm fixed effect of firm i, λ_t denotes the time-fixed effect, and $\varepsilon_{i,t}$ is the random error.

3.2. Variable selection

3.2.1. Green innovation

In the present study, green patent count is used as a measure of green innovation because green innovation is generally measured using green patents (Earnhart, 2004; Kammerer, 2009; Yuan et al., 2020). Green patent applications provide a timely reflection of a company's green innovation activities in a given year, and the green patents that are granted reflect the competitive advantage that the company has gained. Therefore, the number of green patent applications (GP) and the number of green patents granted (GPN) are selected as the green innovation proxy variables of the present study.

Three types of patents are granted in China, namely green invention patents, green utility model patents, and design patents. Companies may apply for utility model and design patents to qualify for preferential policy treatment, and invention patents are usually defined as major innovations because they involve a longer application time and a more complex application process relative to the other two types of patents. Accordingly, the number of green invention patent applications (GPI) and the number of granted green invention patents (GPIN) are used to measure green innovation. The relevant data are obtained from the China Research Data Service (CNRDS) platform.

[Insert Table 1 around here]

3.2.2. Information disclosure quality

In May 2001, the Shenzhen Stock Exchange (SZSE) issued the *Guidelines on Information Disclosure Evaluation Systems for Firms Listed in the SZSE* to encourage listed companies to improve the quality of their information disclosure. This set of guidelines has evolved over time and undergone five revisions, and the most recent one was made in 2020. In these guidelines, the evaluation method section classifies IDRs into four levels from the highest (A) to the lowest (D) on the basis of the information disclosure quality, operational standards, and investor protection level of each listed company. The disclosure evaluation comprehensively covers all aspects of disclosure, and rating results can change over the course of a year, implying favorable comprehensiveness and timeliness. Because listed companies cannot easily manipulate the evaluation results of the stock exchange, the disclosure evaluation indicators provided by the authoritative organizations are generally fair and objective. Information disclosure evaluation results were first released in 2001; thus, a large amount of high-quality data pertaining to these indicators has been accumulated over a long period. For these reasons, researchers consider IDR as an excellent proxy for evaluating the quality of information disclosure. Several studies use IDRs as a proxy variable for evaluating disclosure quality (Yang et al., 2020a; Ho et al., 2022a, b), especially those that study

China-related topics. Disclosure evaluation results are publicly available. Thus, IDRs, which represent a comprehensive evaluation of the overall performance of listed companies in all aspects of disclosure in a given year, are selected as a proxy variable for the quality of corporate disclosure. Table 1 lists and describes the main variables used in the present study.

3.2.3 Control variables

The characteristics of a company can influence its disclosure decisions. For example, companies with poor profitability are generally more likely to engage in financial statement whitewashing and report lower-quality financial information than companies with favorable profitability. To exclude the effects of variables other than green investment, the present study controls for firm size (*SIZE*), financial leverage (*LEV*), mean of firm-specific weekly return (*Return*), return on assets (*ROA*), market-to-book ratio of equity (*MB*), Altman's Z-score (*AZ*), firm-specific weekly return volatility (*SIGMA*), firm age (*LISTAGE*), chief executive officer (CEO) duality (*DUAL*), whether China's Split Share Structure Reform is completed (*SSSR*), largest-shareholder ratio (*TOP%*), and top-two-shareholders ratio (*SEC%*). Table 1 defines the aforementioned variables.

3.2.4 Media attention variables

Media attention is selected as a mediating variable to explore the effect of green innovation on IDRs. The present study uses data on posts (collected from the popular Chinese social media website Guba) as a proxy variable for media attention. Guba is the largest and most influential social platform in China; it has millions of registered users and publishes more than 100,000 posts per day. Numerous researchers use data from Guba (e.g., Meng et al., 2020). Specifically, in the present study, the number of relevant discussion posts, comments, and readings of a given company on Guba and the web search volume index (SVI) of the company are selected as the variables that represent media attention. All variables are logarithmized for analysis. The research data are obtained from the CNRDS platform.

3.3 Data

3.3.1 Sample

The present study uses unbalanced panel data on Chinese companies for the years 2003 to 2019. Data on green patent counts and media attention measures are obtained from the CNRDS platform. Data on IDRs and control variables are obtained from the China Stock Market Accounting Research (CSMAR) database. To account for the presence of outliers in the collected data, 1% winsorizing is performed for all variables. The final sample contains 13,512 firm-year observations for the period from 2003 to 2019.

3.3.2 Summary statistics

Table 2 presents the summary statistics of the main variables. IDRs range from 1 (D; lowest) to 4 (A; highest) with a mean (median) of 3.02 (3) and a standard deviation of 0.62. The results pertaining to the dummy variable of information ratings (Dummy IDR) reveal that only 15% of the companies have a C- or D-grade IDR, which indicates that the overall quality of information disclosure is high. On average, the sampled companies report a return on total assets of 4% and a market-to-book ratio of 4.37; their average number of years listed is 15.15 years, and the average percentage of total shares held by their largest and second-largest shareholders is 33.61% and 10%, respectively. Approximately 26% of the sampled companies exhibit CEO duality.

Table 3 presents the Pearson correlation matrix and variance inflation factor (VIF) of the main variables. The various proxy variables of green innovation all exhibit a significant positive relationship with IDRs, suggesting that companies that engage in green innovation are more inclined to disclose higher-quality financial information. Firm size, ROA, and the percentage of ownership of the top two shareholders of a company all exhibit a significant positive relationship with IDRs; these findings correspond to the general perception that large companies, companies with favorable financial performance, and companies with more external supervision have higher IDRs. All the VIF values listed in Table 3 are less than 2.2, indicating that the analysis results are not severely affected by multicollinearity.

[Insert Table 2-3 around here]

4. Empirical results

4.1. Baseline analysis

The effect of green innovation on corporate information disclosure is analyzed using a fixed effects model. The regression results of the ordinary least squares (OLS) of Equation (1) are listed in Table 4.

For Models 1 to 4 (Models 5 to 8), the key independent variables are the logarithms of GP, GPN, GPI, and GPIN. Models 1 to 4 are used to perform univariate regression analyses, whereas Models 5 to 8 are used to perform multivariate regressions with all control variables being controlled for. Table 4 reveals that the estimated coefficient of green innovation is positive and statistically significant in all model specifications, indicating that green innovation has a positive effect on IDRs. Specifically, the point estimates in Model 4 indicate that each standard deviation increase in GP is associated with an increase of approximately 0.0003 percentage points in IDR, all else being equal. The estimated coefficients of the control variables generally correspond to expectations. Specifically, a more favorable financial position (e.g., larger AZ or ROA) is associated with a higher quality of information disclosure. This finding is consistent with the tendency of firms to increase their disclosure when their performance is favorable (Healy and Palepu, 2001). Furthermore, the external monitoring conducted by the largest shareholder of a firm facilitates the disclosure of high-quality information by the firm. The above analysis supports H1a.

[Insert Table 4 around here]

4.2. Endogeneity

Because both green innovation and disclosure are internally determined by a firm, endogeneity is a problem that may affect the results. Therefore, the 2SLS method, DID method, and GMM system dynamic model are used to determine whether the positive relationship between green innovation and IDR is influenced by omitted variables.

4.2.1 Instrumental variable regressions

A company's disclosure is an endogenous variable (Core, 2001; Healy and Palepu, 2001; Gong et al., 2021). If green innovation decisions are endogenous, the green innovation variable is correlated with the error term, which leads to biased and inconsistent OLS estimates. To mitigate endogenous interferences, the solution proposed by Cui et al. (2018) and Gong et al. (2019) is adopted, that is, the instrumental variable (IV) method is used to test the effect of green innovation on IDRs.

The present study selects the median industry level of the explanatory variables and the 1- and 2-period lags of the explanatory variables as IVs. The 2SLS regression model is derived as follows:

1st stage

$$lnGreen_{i,t} = constant + \delta_1 * lnGreen_{i,t-1} + \delta_2 * lnGreen_{i,t-2} + \delta_3 * lnGreen_{Ind\,i,t} + \theta * control_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}, \quad (2)$$

2nd stage

$$IDR_{i,t} = constant + \beta * \widehat{lnGreen}_{i,t} + \gamma * control_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}. \quad (3)$$

Equation (2) reveals that in the first stage, green innovation is regressed on multiple IVs (e.g., industry median for green innovation and 1- and 2-period lags of green innovation). Equation (3) reveals that in the second stage, the predicted values estimated in the first stage are used to run regressions. Specifically, a firm's green innovation decisions are usually persistent and related to the characteristics of its industry. In addition, green innovation is a long-term decision that is likely to be influenced by past innovations. Accordingly, in the present study, all three selected IVs are predicted to be positively associated with firm-level green innovation. The justification for linking median industry green innovation to a firm's disclosure rating is unclear. The F-test conducted in the first stage reveals high correlations between the IVs and the explanatory variables[1], indicating that the IVs are appropriate.

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[1] Several instrumental variable tests (e.g., F-tests) are performed; none of the tests indicate the presence of weak instrumental variables or the overidentification of problems. The results of these tests are not

The 2SLS regression results are listed in Table 5. For completeness, the results for both the first and second stages are reported. Consistent with expectations, the first-stage results for the firm-level green innovation regressions conducted in Models 1, 3, 5, and 7 indicate that the estimated coefficients of the three IVs are statistically significant at the 1% level. These results suggest that a company's past green innovation and green industry innovation positively influence its green innovation decisions. In the second stage model that is applied in Models 2, 4, 6, and 8, the estimated positive effect of green innovation on IDRs is revealed to be robust at the 1% level regardless of the green innovation measure that is used. The results of the IV regressions indicate that the effect of green innovation on disclosure quality is robust after accounting for endogeneity.

[Insert Table 5 around here]

4.2.2 DID method

The *Integrated Reform Plan for Promoting Ecological Progress* was released by the Central Committee of the Communist Party of China and the State Council in 2015; it serves as a quasi-natural experiment that applies the DID method to test whether an environment that focuses more on green innovation has a greater effect on the association between green innovation and IDRs[2]. The DID method requires an event to affect independent variables but not necessarily outcome variables. The present study posits that the enactment of the aforementioned plan inevitably creates an environment that is highly focused on green innovation, which in turn increases the competitive advantage of innovative green firms. That is, an event that encourages firm innovation but does not necessarily affect disclosure decisions is selected. Specifically, the dummy variable $After2015_t$ is assigned a value of 1 if the year is 2015 and later, otherwise, it

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present in the main text.

[2] The Central Committee of the Communist Party of China (CPC) and the State Council released the *Integrated Reform Plan for Promoting Ecological Progress* in 2015, which is the top-level plan for the reform of China's ecological civilization; this plan was introduced to improve the national governance system and promote the modernization of China's governance capacity in relation to the development of an ecological civilization. The release of the reform plan gradually converted the development of an ecological civilization from a concept or policy to a concrete operational plan.

is assigned a value of zero. The applied regression formula is as follows:

$$IDR_{i,t} = constant + \varphi_1 * lnGreen_{i,t} + \varphi_2 * lnGreen_{i,t} * After2015_t + \varphi_3 * After2015_t + \upsilon * control_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}. \quad (4)$$

In addition, five samples are constructed using 2015 as the policy year and with the number of years before and after the policy year ranging from 1 to 5 years[3], and the results for all five samples are consistent. Table 6 presents the results of the DID test that is conducted using Equation (4) and the sample comprising data spanning the 1-year periods before and after policy implementation. The results indicate that after the implementation of the policy, an environment that focuses more on green innovation increases the influence of green innovation on IDRs; this finding indicates that the positive effect of green innovation on disclosure quality is robust[4]. Therefore, the endogeneity problems of the present study are generally alleviated, providing further evidence for H1a.

[Insert Table 6 around here]

4.2.3 GMM system dynamic model

To further alleviate endogeneity-related concerns, the GMM system dynamic model proposed by Cui et al. (2018) is employed to estimate the green innovation–IDR relationship while considering past IDRs to account for the dynamic aspects of this relationship. The applied regression formula is as follows:

$$IDR_{i,t} = constant + \beta * lnGreen_{i,t} + \gamma * control_{i,t} + \kappa_1 IDR_{i,t-1} + \kappa_2 IDR_{i,t-2} + \mu_i + \lambda_t + \varepsilon_{i,t}. \quad (5)$$

Table 7 lists the estimations obtained through the GMM system dynamic model

[3] For example, a sample spanning the 2 years before and after policy implementation (i.e., 2015) is constructed in the present study, and this sample only contains observations from 2013 to 2017.
[4] Consistent results can be obtained from other samples with varying lengths; the related results are not presented in the main text.

applied in Equation (5). Similar to the fixed-effect, 2SLS, and DID regression results, the relationship between the measures of green innovation and IDRs is significantly positive, which supports H1a. The estimated coefficients obtained through the GMM system dynamic model exhibit higher levels of statistical significance and a greater magnitude relative to the results of the fixed effects model; this finding indicates that green innovation is still a key factor influencing the disclosure decisions of companies even after endogenous interferences are excluded.

The results obtained after conducting the aforementioned endogeneity analysis are still consistent and indicative that an increase in green innovation leads to an improvement in IDRs. Therefore, the endogeneity problems of the present study are generally alleviated.

[Insert Table 7 around here]

4.3. Robustness Test

A set of robustness tests are conducted. First, a dummy variable of IDR is used to replicate the results in Table 4 to test the robustness of the empirical results. The dummy variable of an IDR equals 1 when an IDR is >2; otherwise, it equals zero. The result of the test, reported in Model 1 of Table 8, is similar to those obtained through IDRs[5].

[Insert Table 8 around here]

Second, an IDR that excludes the industry average by subtracting industry annual average IDR from firm IDR is used to perform an analysis. Because companies consider the information disclosed by other companies in their industry when they make information disclosures (Seo, 2021), information disclosures differ considerably across various industries because of factors such as the levels of information asymmetry and competition in an industry. Therefore, excluding industry averages can eliminate various concerns regarding the influence of industry factors on the results. The results

[5] Table 8 reports the regression results only for the number of green patent applications (GP) as the dependent variable. The results are robust to the use of other proxies for green innovation. These results are not present in the main text due to space considerations.

of the deindustrialized IDR regression are listed in Model 2 of Table 8, and the estimated coefficient obtained is revealed to be similar to the results of the baseline regression and significant at the 1% level; this finding indicates that the effect of green innovation on IDRs remains unchanged after accounting for industry factors.

Third, the analysis of the baseline specifications is repeated using a standardized IDR to avoid biased results due to magnitude-related problems; the analysis is performed in accordance with the model proposed by Pan et al. (2015). The result of the standardized IDR is listed in Model 3 of Table 8, and it indicates that all regression specifications are significant at the 1% level, suggesting that magnitude does not distort the effect of green innovation on IDRs.

Next, the robustness of the results is validated after adjustment for a separate sample. All firms that did not engage in green innovation during the sample period are removed to ensure that the results are not influenced by these noninnovative firms. The results in Panel A of Table 9 reveal that among the firms that engaged in green innovation, an increase in green innovation can still lead to a higher IDR.

[Insert Table 9 around here]

Finally, only the firm-year observations with green innovation are retained (i.e., the sample only contains observations in which the number of green patents is not equal to zero). Panel B of presents the estimates of whether the constructed sample influences the effects of green innovation in the absence of green innovation. All specifications indicate that the effect of green innovation on IDR in this model is greater than the effect observed at baseline and that this effect is significant at the 1% level; that is, the effect of green innovation is more significant during the years in which firms engaged in green innovation. The results of all robustness tests reveal that the positive effect of green innovation on IDR is significant and robust[6].

[6] Several tests of the effect of lagged green innovation on the firm disclosure are conducted; the main results hold, indicating green innovation has a persistent impact on firm's disclosure decisions. The results of these tests are not present in the main text.

4.4. Channel

The results discussed in the preceding subsection suggest that green innovation positively influences IDRs. In this subsection, influence channels are investigated.

The media serves the dual functions of information dissemination and corporate governance, and it is a key channel that stakeholders use to understand companies (Luo et al., 2022). On the one hand, the media focuses on improving a company's IDR by expanding its competitive advantage. It acts as an information broker that disseminates information about a company to stakeholders to gain favor with stakeholders and consumers (Mullainathan and Shleifer, 2005). Companies attract media attention through green innovation and send signals through the media to enhance their competitive advantage and reduce the incentive to disclose low-quality information.

On the other hand, media attention plays the role of monitoring corporate governance and improving the quality of corporate disclosures. Numerous studies report the positive role of the media in corporate governance (Besley and Prat, 2006; Gillan, 2006; Dyck et al., 2008). By reporting and disseminating information about companies, the media helps to reduce potential asymmetries between companies and investors (Yang et al., 2020b; Chen, et al.; 2022), thereby indirectly conducting effective supervision. Through external governance mechanisms and their influence on public opinion, the media can help improve corporate governance and enhance the quality of corporate environmental information disclosures (Liu and McConnell, 2013; Yang et al., 2014; Rogers et al., 2016). Therefore, the present study posits that media attention can improve corporate information transparency and reinforce the relationship between corporate green innovation and IDR through its dual functions. In accordance with the model developed by Lin et al. (2011, 2013), the present study analyzes the potential mechanisms that enable green innovation to influence IDR.

First, the total number of company-related posts on Guba is used as a proxy variable for company media attention to conduct regressions. The specifications control for firm characteristics are firm size, financial leverage, mean of firm-specific weekly return, ROA, market-to-book ratio of equity, Altman's Z-score, firm-specific weekly return volatility, firm age, CEO duality, whether China's Split Share Structure Reform is completed, the largest-shareholder ratio, and the top-two-shareholders ratio. In addition, the present study controls for firm fixed effects and year fixed effects to eliminate the effects of time-invariant factors and time trends on its results.

The regression results presented in columns 1 of Table 10 are obtained using the logarithms of green patent (GP) as dependent variables[7]. This column include all control variables and fixed effects. The regression result supports the conjecture that green innovation affects IDR through media attention. In the Model 1 of Table 10, the logarithm of the green innovation measure is significantly and positively correlated with the logarithm of the total number of posts for all specifications. The evidence obtained in the present study suggests that companies that engage in more green innovation attract more media attention.

[Insert Table 10 around here]

Second, the number of company-related comments on Guba is used to measure media attention. The analysis specification corresponds to the result for the analysis of the total number of posts, including the results for all control variables. The result of the logarithm regression of the number of comments is presented in Model 2 of Table 10, and it supports the findings on media attention. Specifically, the number of green innovations is revealed to be positively correlated with the amount of media attention received, as indicated by the positive and statistically significant coefficients obtained for this specification.

Third, the number of company-related readings on Guba is used to measure media attention. On the basis of the same specification used in the preceding paragraph, the regression result is presented in Model 3 of Table 10. The estimated coefficient of the green innovation variable is positive and statistically significant at the 1% level. In other words, the evidence indicates that companies that engage in more green innovation attract more media attention; this finding is consistent with these companies' behavior

[7] Table 10 reports the regression results only for the number of green patent applications (GP) as the dependent variable. The results are robust to the use of other proxies for green innovation. For space reasons, these results are not present in the main text.

of disclosing higher quality information when they are subjected to stronger external supervision or operating in more transparent information environment.

Finally, to ensure the robustness of the results, another set of sample data from the SVI of companies is used for analysis to supplement the analysis of the Guba data sample. The SVI is an excellent proxy variable for media attention because the keywords associated with a listed company's stock code, company name, and company abbreviation can reflect the search popularity of the company and the sentiments of Internet users. To obtain the regression analysis result presented in Model 4 of Table 10, the logarithm SVI is used as the outcome variable, and the specification applied for the Guba sample is used. Model 4 of Table 10 reveals that the effect of green innovation in increasing a company's SVI is significant at the 1% level for all specifications; this finding indicates that the media is more inclined to pay attention to companies that engage in more green innovation, which increases their disclosure ratings.

4.5. Heterogeneous

4.5.1. Industry pollution degree

Companies in heavily polluting industries implement more environmental pollution practices and are subject to more stringent environmental regulations relative to companies in low-polluting industries. Green innovation is often motivated by environmental protection requirements, and establishing green innovation as a company's main competitive advantage can be a difficult task. By contrast, in low-polluting industries, companies attract more media attention and investors who emphasize green innovation. Green innovation also creates more advantages for a company. Accordingly, the positive effect of green innovation on IDR is predicted to be more pronounced in low-polluting industries than in heavily polluting industries.

On the basis of the framework developed by Gu et al. (2021) and Yao et al. (2021), 16 industries (e.g., thermal power, steel, and cement) are identified as heavily polluting industries by referencing the *Guidelines on Environmental Information Disclosure of Listed Companies* (Exposure Draft) released by the Ministry of Environment and Environmental Protection in 2010 and the *Guidelines on Industry Classification of*

Listed Companies that was most recently revised by the China Securities Regulatory Commission in 2012[8]. The estimation results of two sample regressions divided by the industry results are shown in Table 11. The results correspond to the prediction that the positive effect of green innovation is significant in low-polluting industries, whereas its effect on IDRs is insignificant in heavily polluting industries. The effect of green innovation in heavily polluting industries is significantly different from that observed in other industries.

[Insert Table 11 around here]

4.5.2. Industry competition level

The heterogeneity of industry competition level is further considered. In competitive industries[9], the competitive advantages generated by green innovation can help companies to improve their performance; thus, companies in competitive industries are more incentivized to disclose high-quality financial information than companies in other industries. In addition, companies that engage in green innovation are more likely to attract media and investor attention, leading to external supervision. Accordingly, green innovation is more likely to improve the IDRs of companies in highly competitive industries.

The full sample is divided into two subsamples by using the median of the Herfindahl–Hirschman Index (HHI), and the regression results are presented in Table 12. An HHI value of 1 is greater than the median and indicates a less competitive industry. As predicted, the increase in green innovation leads to a significant increase in IDR in highly competitive industries (the group with an HHI of zero), and the corresponding magnitude is greater than that at baseline; by contrast, in less competitive industries, the effect of green innovation is insignificant.

[Insert Table 12 around here]

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[8] Specifically, the industry codes for heavily polluting industries are B06, B07, B08, B09, C17, C19, C22, C25, C26, C28, C29, C30, C31, C32, and D44.

[9] In the sample analyzed, the most competitive industry is manufacturing, followed by information transmission, software and information technology services.

5. Conclusion and policy implications

In recent decades, climate change has been recognized as a serious threat to the sustainable development of the world economy (Afrifa et al., 2020; Jiang et al., 2021; Dogan et al., 2022). Green innovation plays a key role in meeting the commitments of the *Paris Agreement* and reaching the "double carbon" goal (e.g., Ullah et al., 2022). Although the environmental impact of green innovation has been extensively studied, the exploration of green innovation on corporate decisions has been limited. The positive consequences of green innovation must be discussed in the context of green transformation. On the basis of 13,512 firm-year observations of IDR and green innovation data collected from China for the period from 2003 to 2019, the present study investigates the relationship between green innovation and IDR. It also examines the mediating role that media attention plays in this relationship. In addition, the industry heterogeneity of the effect of green innovation is examined. The main conclusions and policy implications are as follows.

Three findings are derived from the results of the present study. First, the estimates from the baseline analysis reveal the crucial role of green innovation in increasing the IDR of a company. This finding further clarifies the economic consequences of green innovation. In addition, the relationships between control variables and IDR are consistent with the predictions of the present study. Second, the estimation results obtained through IV regression, the difference-in-differences method, and the GMM system dynamic model are analyzed. The significant positive effect of green innovation on the IDR of a company still exists after exclusion of endogenous interferences. Meanwhile, the robustness test results are consistent with the baseline results when other proxy variables for IDR are used. Third, green innovation influences company disclosure decisions through media attention. Fourth, the heterogeneous effect of green innovation is observed across multiple industries. For companies in low polluting industries, green innovation significantly improves their IDRs; however, for companies in heavily polluting industries, this effect is insignificant. Green innovation helps to improve the IDRs of companies in highly competitive industries, but its effect on the IDRs of companies in less competitive industries is insignificant.

On the basis of the aforementioned empirical evidence, the following policy recommendations are proposed. First, the understanding of green innovation and its effects must be enhanced. The positive effects of green innovation promote not only environmental sustainability but also economic development. Understanding the effects of green innovation can help policymakers to increase the incentive for companies to engage in green innovation and the interest of stakeholders in green innovation, providing more intrinsic motivation and external pressure for firms to achieve their green transformation and emission reduction goals. The findings of this paper suggest a new engine for achieving countries' climate goals by promoting green innovation and recognizing the dual role it plays in achieving sustainable development and economic growth. Second, the media should be actively guided to play a supervisory role, especially in the delivery of green innovation–related information to stakeholders; this arrangement helps companies to better implement green innovation and subjects them to stronger external supervision. The Chinese government should follow the actions agreed upon at COP 26 to help regulate media scrutiny and provide opportunities for corporate green innovation. Third, policies should be formulated in accordance with industry characteristics to encourage green innovation. In heavily polluting and highly monopolistic industries, green innovation negatively influences the IDRs of companies. Thus, stakeholders may be less incentivized to supervise companies with respect to green innovation. Regulators should increase their supervision of such industries while increasing the incentives for green innovation and the penalties for environmental pollution.

In light of COP26, countries need to move from making commitments to taking action (Lee et al., 2022; Wu et al., 2023). Countries are constrained to vary degrees by carbon reduction targets. Imposing mandatory constraints on sustainable development goals has different effects on the economies of all countries. It significantly undermines the current growth and welfare of developing economies and, to a lesser extent, developed countries (Lu et al., 2022). Like many developing countries, China has a different industrial structure than developed countries and faces the daunting task of reconciling economic development with action to reduce emissions (Wang et al., 2022;

Wu et al., 2023). The results of this paper can draw lessons for more developing countries.

The present study has several limitations. First, it does not discuss the effect of the quality of green innovation on the results because it does not examine the specific information pertaining to each green patent. Relative to low-quality green innovation, high-quality green innovation may have a more significant effect on improving IDR. Second, because of data availability, the proxy variables for media attention are mainly related to network media. The present study also lacks further exploration of the emotions conveyed by social media, such as Wu et al. (2021). In future studies, the findings of the present study may be expanded by exploring various types of media attention as well as media sentiment.

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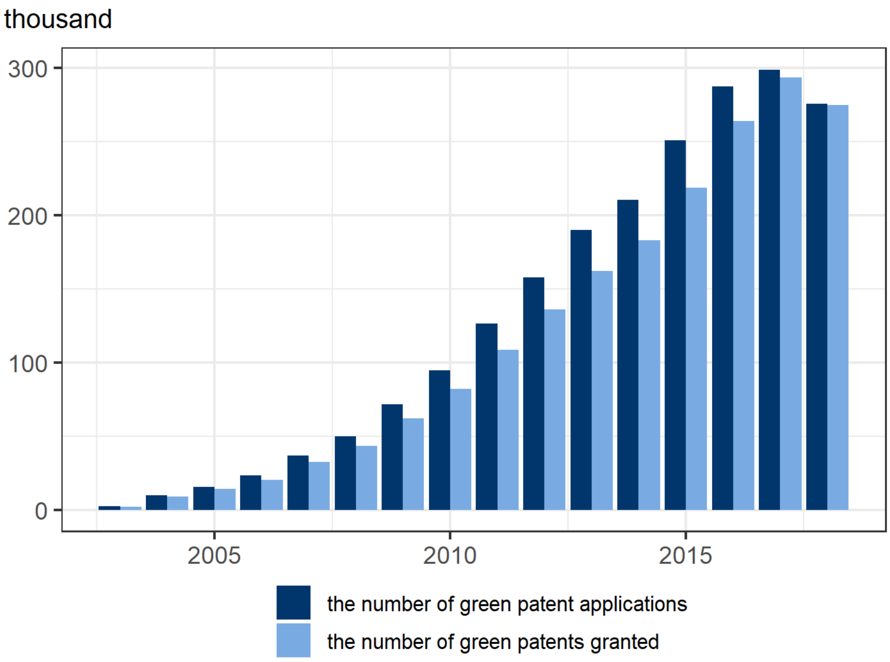

Figure 1. The development of green innovation

Note: This figure shows the number of green patents in China over the years. Both the number of patent applications and the number of patents granted have increased substantially, demonstrating the tremendous growth of green innovation in China over the last two decades.

Table 1. Variable definitions

	Variable definitions
Information disclosure rating measures	
IDR	The information disclosure rating (IDR) ranges from 1 (the lowest) to 4 (the highest).
Dummy (IDR)	Dummy variable of IDR: equal to 1 when IDR is greater than 2, equal to 0 otherwise.
adj_IDR	Excluding industry average IDR: Company IDR minus industry annual average IDR.
IDRs	Standardized IDR: the difference between IDR and average IDR scaled by the company's IDR standard deviation (Pan et al., 2015).
Green patent measures	
GP	ln (the number of green patent applications+1)
GPN	ln (the number of green patents granted+1)
GPI	ln (the number of green invention patent applications+1)
GPIN	ln (the number of green invention patents granted+1)
Control variables measures	
SIZE	Natural log of market capitalization.
LEV	The total long-term debt is divided by total assets.
Return	The mean of firm-specific weekly returns over the fiscal year period.
ROA	Net income by total assets.
MB	Ratio of the market value of equity to book value of equity.
AZ	Altman's Z-score, defined as (3.3*operating income + sales + 1.4*retained earnings + 1.2*(current assets - current liability)) / total assets
SIGMA	The standard deviation of firm-specific weekly returns over the fiscal year period.
LISTAGE	Firm age, measured by the natural logarithm of (1+the firm's establish period).
DUAL	CEO duality: a dummy variable, with 0 for a company having separate CEO and chairman, and 1 otherwise.
SSSR	The China's Split Share Structure Reform, and defining to be 1 if the observation is from 2006 and after.
TOP (%)	Percentage of total outstanding shares owned by the largest shareholder.
SEC (%)	Percentage of total outstanding shares owned by top two shareholders.
Other measures	
Tpostnum	ln (total number of company-related posts on the Guba during the statistical time period+1)
Commentnum	ln (total number of company-related comments on the Guba during the statistical time period+1)
Readnum	ln (total number of company-related readings on the Guba during the statistical time period+1)
ln_SVI_All	ln (web search volume index (SVI) (total)+1), where web search volume index (SVI) sums up the search value of keywords such as stock code, company abbreviation, full company name, etc.
Pollution	When the industry code is B06, B07, B08, B09, B10, B11, B12, C17, C18, C19, C22, C25, C26, C27, C28, C29, C31, C32, D44, the Pollution is equal to 1, otherwise it is equal to 0.
Dummy (HHI)	When the HHI is greater than the median, the dummy (HHI) is equal to 1, otherwise it is equal to 0.

Notes: This table presents the definition of variables used in this paper. Green innovation is measured by the number of green patents, which is the main independent variable; information disclosure rating is the main dependent variable.

Table 2. Summary statistics

Variable	Mean	SD	Min	1st Quartile	Median	3rd Quartile	Max
IDR	3.02	0.62	1.00	3.00	3.00	3.00	4.00
Dummy (IDR)	0.85	0.36	0.00	1.00	1.00	1.00	1.00
adj_IDR	0.04	0.61	-1.96	-0.07	0.01	0.19	1.23
IDRs	0.06	0.98	-3.00	-0.12	0.01	0.33	1.89
GP	2.98	1.34	0.69	2.08	2.94	3.81	6.77
GPN	2.87	1.36	0.00	1.95	2.83	3.71	6.69
GPI	2.32	1.40	0.00	1.39	2.30	3.14	6.26
GPIN	2.09	1.43	0.00	1.10	1.95	2.94	6.13
SIZE	22.36	0.95	20.43	21.69	22.29	22.92	24.96
LEV	0.06	0.08	0.00	0.00	0.02	0.08	0.36
Return	0.00	0.01	-0.02	-0.01	-2.E-03	3.E-03	0.02
ROA	0.04	0.06	-0.22	0.02	0.04	0.07	0.19
MB	4.37	18.60	0.67	1.93	2.98	4.80	17.31
AZ	1.26	0.84	-0.98	0.85	1.27	1.69	3.19
SIGMA	0.05	0.02	0.02	0.04	0.05	0.06	0.13
AGE	15.15	6.03	3.26	10.87	14.76	19.00	30.74
DUAL	0.26	0.44	0.00	0.00	0.00	1.00	1.00
SSSR	0.96	0.20	0.00	1.00	1.00	1.00	1.00
TOP (%)	33.61	14.46	9.00	22.47	31.19	42.64	70.77
SEC (%)	10.00	6.98	0.46	4.47	8.67	14.18	30.42

Notes: This table presernts the mean, standard deviation, minimum, 25% percentile, median, 75% percentile and maximum of the main variables used in this paper for the entire sample. The sample period is from 2003 to 2019. *IDR*, *Dummy (IDR)*, *adj_IDR* and *IDRs* are the measures of information disclosure quality. *GP*, *GPN*, *GPI*, and *GPIN* are the measures of green innovation, the larger the more innovative.

Table 3. Correlation coefficient matrix and variance inflation factor

		VIF	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(1)	*IDR*		1.00																			
(2)	*Dummy (IDR)*		**0.77**	1.00																		
(3)	*adj_IDR*		**0.98**	**0.74**	1.00																	
(4)	*IDRs*		**0.98**	**0.74**	**0.99**	1.00																
(5)	*GP*	1.18	**0.16**	**0.10**	**0.13**	**0.13**	1.00															
(6)	*GPN*		**0.16**	**0.10**	**0.13**	**0.13**	**0.99**	1.00														
(7)	*GPI*		**0.17**	**0.10**	**0.14**	**0.14**	**0.91**	**0.88**	1.00													
(8)	*GPIN*		**0.17**	**0.10**	**0.14**	**0.14**	**0.88**	**0.88**	**0.97**	1.00												
(9)	*SIZE*	1.46	**0.24**	**0.12**	**0.20**	**0.20**	**0.35**	**0.35**	**0.36**	**0.37**	1.00											
(10)	*LEV*	1.22	**-0.04**	**-0.05**	**-0.04**	**-0.04**	0.01	**0.02**	**0.02**	**0.03**	**0.17**	1.00										
(11)	*Return*	1.33	**0.07**	**0.07**	**0.06**	**0.05**	**0.02**	0.01	**0.02**	0.01	**0.19**	**-0.07**	1.00									
(12)	*ROA*	2.12	**0.36**	**0.31**	**0.36**	**0.35**	**0.05**	**0.04**	**0.06**	**0.05**	**0.24**	**-0.19**	**0.22**	1.00								
(13)	*MB*	1.02	**-0.04**	**-0.04**	**-0.04**	**-0.04**	**-0.01**	**-0.02**	-0.01	-0.01	**0.02**	**-0.03**	**0.07**	-0.01	1.00							
(14)	*AZ*	2.10	**0.30**	**0.26**	**0.29**	**0.29**	**0.05**	**0.04**	**0.05**	**0.04**	**0.11**	**-0.29**	**0.13**	**0.63**	**-0.22**	1.00						
(15)	*SIGMA*	1.32	**-0.13**	**-0.10**	**-0.13**	**-0.13**	**-0.05**	**-0.05**	**-0.04**	**-0.06**	**0.12**	**-0.09**	**0.43**	**-0.04**	**0.09**	**-0.07**	1.00					
(16)	*AGE*	1.14	-0.01	**-0.03**	**-0.04**	**-0.04**	**0.07**	**0.08**	**0.07**	**0.10**	**0.21**	**0.19**	**-0.03**	**-0.14**	0.00	**-0.13**	**-0.03**	1.00				
(17)	*DUAL*	1.02	-0.01	0.00	**-0.02**	**-0.02**	**0.07**	**0.07**	**0.07**	**0.07**	0.01	**-0.08**	**0.02**	**0.04**	0.01	**0.03**	**0.04**	**-0.07**	1.00			
(18)	*SSSR*	1.10	**0.06**	**0.07**	**-0.05**	**-0.04**	**0.16**	**0.16**	**0.14**	**0.13**	**0.23**	-0.01	**0.04**	**0.02**	**0.02**	**0.02**	**0.05**	**0.17**	**0.07**	1.00		
(19)	*TOP (%)*	1.09	**0.10**	**0.07**	**0.11**	**0.10**	-0.01	-0.01	**-0.02**	**-0.02**	**0.05**	0.01	0.02	0.12	0.00	0.12	**-0.02**	**-0.09**	0.00	**-0.07**	1.00	
(20)	*SEC (%)*	1.08	**0.02**	**0.04**	0.01	0.01	**-0.03**	**-0.03**	**-0.04**	**-0.04**	**-0.02**	**-0.11**	0.01	0.11	-0.01	0.11	**0.03**	**-0.12**	0.06	**0.03**	**-0.19**	1.00

Notes: This table presents Pearson's correlation matrix and variance inflation factor (VIF) of the main variables used in the paper. VIF is a measure of the severity of multicollinearity in the ordinary least square (OLS) regression analysis. Bold font denotes statistical significance at the 10% level.

Table 4. Estimation results of the baseline specification

Panel A

Dependent Variable			IDR					
	Model 1		Model 2		Model 3		Model 4	
GP	0.0313	***						
	(4.89)							
GPN			0.0322	***				
			(5.14)					
GPI					0.0244	***		
					(4.26)			
GPIN							0.0242	***
							(4.35)	
Intercept	3.2800	***	3.282	***	3.2848	***	3.2860	***
	(9.08)		(9.08)		(9.09)		(9.09)	
Year fixed effect	YES		YES		YES		YES	
Firm fixed effect	YES		YES		YES		YES	
ADJ-RSQ	0.42		0.42		0.42		0.42	
Observations				13,512				

Panel B

Dependent Variable			IDR					
	Model 5		Model 6		Model 7		Model 8	
GP	0.0217	***						
	(3.33)							
GPN			0.0220	***				
			(3.46)					
GPI					0.0184	***		
					(3.17)			
GPIN							0.0188	***
							(3.35)	
SIZE	0.081	***	0.0808	***	0.081	***	0.0813	***
	(6.61)		(6.60)		(6.65)		(6.65)	
LEV	-0.164	*	-0.1622	*	-0.165	*	-0.1637	*
	(-1.85)		(-1.83)		(-1.86)		(-1.84)	
Return	1.805	***	1.8097	***	1.797	***	1.8085	***
	(2.57)		(2.58)		(2.56)		(2.58)	
ROA	1.906	***	1.9061	***	1.908	***	1.9075	***
	(12.74)		(12.74)		(12.75)		(12.75)	
MB	0.000	***	0.0002		0.000		0.0002	
	(12.74)		(0.70)		(0.68)		(0.69)	
AZ	0.074	***	0.0736	***	0.074	***	0.0741	***
	(5.12)		(5.10)		(5.15)		(5.14)	
SIGMA	-3.959	***	-3.958	***	-3.964	***	-3.965	***
	(-11.95)		(-11.95)		(-11.97)		(-11.97)	

LISTAGE	-166.290		-165.0122		-160.513		-158.7626	
	(-0.09)		(-0.09)		(-0.08)		(-0.08)	
DUAL	-0.001		-0.0013		-0.001		-0.0012	
	(-0.07)		(-0.08)		(-0.05)		(-0.07)	
SSSR	2,163.140		2146.5126		2,087.985		2065.2137	
	(0.09)		(0.09)		(0.08)		(0.08)	
TOP	0.003	***	0.0034	***	0.003	***	0.0034	***
	(4.31)		(4.31)		(4.32)		(4.32)	
SEC	-0.001		-0.0007		-0.001		-0.0007	
	(-0.56)		(-0.56)		(-0.57)		(-0.57)	
Intercept	1959.7507		1,944.700		1891.7088		1871.0954	
	(0.09)		(0.09)		(0.08)		(0.08)	
Year fixed effect	YES		YES		YES		YES	
Firm fixed effect	YES		YES		YES		YES	
ADJ-RSQ	0.48		0.48		0.48		0.48	
Observations				12,500				

Notes: This table presents the impact of green innovation on information disclosure quality. Panel A reports the estimates without control variables, and Panel B reports the estimates of Equation (1). For each model, the dependent variable is the information disclosure rating. Model 1-4 (Model 5-8) report the results for the logarithm of one plus the number of green patents applications (GP), the logarithm of one plus the number of green patents granted (GPN), the logarithm of one plus the number of green invention patent applications (GPI) and the logarithm of one plus the number of green invention patent granted (GPIN), respectively. We report robust t-statistics in parenthesis, while ***, **, * denote statistical significance at 1%, 5%, and 10% level, respectively.

Table 5. Endogenous: Instrumental variable regressions

	First stage:	Second stage:	First stage:	Second stage:	First stage:	Second stage:	First stage:	Second stage:
Dependent Variable	*X*	*IDR*	*X*	*IDR*	*X*	*IDR*	*X*	*IDR*
	X = *GP*		*X* = *GPN*		*X* = *GPI*		*X* = *GPIN*	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Xt-1	0.5760 ***		0.5640 ***		0.5487 ***		0.5303 ***	
	(58.31)		(57.72)		(56.61)		(55.18)	
Xt-2	0.2528 ***		0.2534 ***		0.2600 ***		0.2599 ***	
	(25.54)		(25.91)		(26.73)		(26.89)	
X_Ind	0.2633 ***		0.2640 ***		0.1630 ***		0.1638 ***	
	(20.07)		(19.59)		(10.92)		(10.68)	
X_{2SLS}		0.0312 ***		0.0334 ***		0.0274 ***		0.0268 ***
		(2.84)		(3.06)		(2.70)		(2.66)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES	YES	YES
Firm fixed effect	YES	YES	YES	YES	YES	YES	YES	YES
ADJ-RSQ	0.70	0.52	0.68	0.52	0.66	0.52	0.64	0.52
Observations	9,661							

Notes: This table presents the estimation results of the 2SLS regression to alleviate the endogeneity problem. Model 1, Model 3, Model 5, and Model 7 report the results of first stage of Equation (2), and Model 2, Model 4, Model 6, and Model 8 report the results of second stage of Equation (3). For each model, the dependent variable is the information disclosure rating. Model 1 (Model 2), Model 3 (Model 4), Model 5 (Model 6) and Model 7 (Model 8) report the results for the logarithm of one plus the number of green patents applications (GP), the logarithm of one plus the number of green patents granted (GPN), the logarithm of one plus the number of green invention patent applications (GPI) and the logarithm of one plus the number of green invention patent granted (GPIN), respectively. All regressions control for firm and year fixed effects. We report robust t-statistics in parenthesis, while ***, **, * denote statistical significance at 1%, 5%, and 10% level, respectively.

Table 6. Endogenous: Difference-in-difference method

Dependent Variable	IDR							
	X = GP		*X = GPN*		*X = GPI*		*X = GPIN*	
	Model 1		Model 2		Model 3		Model 4	
*X * After2015*	0.0361	**	0.0376	**	0.0371	***	0.0413	***
	(2.20)		(2.33)		(2.39)		(2.71)	
X	-0.0321		-0.0396	*	-0.0224		-0.0318	
	(-1.31)		(-1.65)		(-1.07)		(-1.59)	
After2015	-7001.1572		-6849.7365		-7337.4818		-7161.5544	
	(-0.36)		(-0.36)		(-0.38)		(-0.37)	
Control variables	YES		YES		YES		YES	
Year fixed effect	YES		YES		YES		YES	
Firm fixed effect	YES		YES		YES		YES	
ADJ-RSQ	0.62		0.76		0.76		0.76	
Observations	2,573							

Notes: This table presents the estimation results of the DID method of Equation (4) to alleviate the endogeneity problem. For each model, the dependent variable is the information disclosure rating. Model 1-4 report the results for the logarithm of one plus the number of green patents applications (GP), the logarithm of one plus the number of green patents granted (GPN), the logarithm of one plus the number of green invention patent applications (GPI) and the logarithm of one plus the number of green invention patent granted (GPIN), respectively. All regressions control for firm and year fixed effects. We report robust t-statistics in parenthesis, while ***, **, * denote statistical significance at 1%, 5%, and 10% level, respectively.

Table 7. Endogenous: GMM system dynamic model

Dependent Variable	IDR			
	Model 1	Model 2	Model 3	Model 4
GP_GMM	0.0371 ***			
	(6.61)			
GPN_GMM		0.0370 ***		
		(7.15)		
GPI_GMM			0.0373 ***	
			(7.21)	
GPIN_GMM				0.0381 ***
				(7.35)
Control variables	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES
Firm fixed effect	YES	YES	YES	YES
ADJ-RSQ	0.21	0.22	0.22	0.22
Observations	12,500			

Notes: This table presents the estimation results of the GMM system dynamic model of Equation (5) to alleviate the endogeneity problem. For each model, the dependent variable is the information disclosure rating. Model 1-4 report the results for the logarithm of one plus the number of green patents applications (GP), the logarithm of one plus the number of green patents granted (GPN), the logarithm of one plus the number of green invention patent applications (GPI) and the logarithm of one plus the number of green invention patent granted (GPIN), respectively. All regressions control for firm and year fixed effects. We report robust t-statistics in parenthesis, while ***, **, * denote statistical significance at 1%, 5%, and 10% level, respectively.

Table 8. Robustness: Alternative measure of IDR

Dependent Variable	*Dummy (IDR)*		*adj_IDR*		*IDRs*	
	Model 1		Model 2		Model 3	
GP	0.0080	**	0.0217	***	0.0328	***
	(1.97)		(3.34)		(3.17)	
Control variables	YES		YES		YES	
Year fixed effect	YES		YES		YES	
Firm fixed effect	YES		YES		YES	
ADJ-RSQ	0.36		0.46		0.46	
Observations			12,500			

Notes: This table presents the estimation results of robustness test. For each model, the in the dependent variable is the logarithm of one plus the number of green patents applications (GP). Model 1-3 report the results for the dummy variable of information disclosure rating (*Dummy (IDR)*), the excluding industry average information disclosure rating (*adj_IDR*) and the standardized information disclosure rating (*IDRs*). All regressions control for firm and year fixed effects. We report robust t-statistics in parenthesis, while ***, **, * denote statistical significance at 1%, 5%, and 10% level, respectively.

Table 9. Robustness: Different samples

Panel A

Dependent Variable	IDR			
	Model 1	Model 2	Model 3	Model 4
GP	0.0213 ***			
	(3.27)			
GPN		0.0217 ***		
		(3.41)		
GPI			0.0180 ***	
			(3.09)	
GPIN				0.0186 ***
				(3.31)
Control variables	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES
Firm fixed effect	YES	YES	YES	YES
ADJ-RSQ	0.47	0.47	0.47	0.47
Observations	12,408			

Panel B

Dependent Variable	IDR			
	Model 1	Model 2	Model 3	Model 4
GP	0.0228 ***			
	(3.02)			
GPN		0.0251 ***		
		(3.32)		
GPI			0.0225 ***	
			(3.08)	
GPIN				0.0237 ***
				(3.28)
Control variables	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES
Firm fixed effect	YES	YES	YES	YES
ADJ-RSQ	0.49	0.49	0.49	0.49
Observations	10,664			

Notes: This table presents the estimation results of robustness test. The sample in Panel A includes only companies that have had green innovations. The sample in Panel B only includes companies that have had green innovations in the year. For each model, the dependent variable is the information disclosure rating. Model 1-4 report the results for the logarithm of one plus the number of green patents applications (GP), the logarithm of one plus the number of green patents granted (GPN), the logarithm of one plus the number of green invention patent applications (GPI) and the logarithm of one plus the number of green invention patent granted (GPIN), respectively. All regressions control for firm and year fixed effects. We report robust t-statistics in parenthesis, while ***, **, * denote statistical significance at 1%, 5%, and 10% level, respectively.

Table 10. Channel: Media attention

Dependent Variable	*Tpostnum*		*Commentnum*		*Readnum*		*SVI_All*	
	Model 1		Model 2		Model 3		Model 4	
GP	0.0209	***	0.0293	***	0.0210	***	0.0187	***
	(3.07)		(3.36)		(3.07)		(3.46)	
Control variables	YES		YES		YES		YES	
Year fixed effect	YES		YES		YES		YES	
Firm fixed effect	YES		YES		YES		YES	
ADJ-RSQ	0.78		0.70		0.85		0.84	
Observations	11,692		11,692		11,692		11,065	

Notes: This table presents the estimation results of the potential channel. For each model, the independent variable is the logarithm of one plus the number of green patent applications (GP). Model 1-4 report the results for the logarithm of one plus the total number of company-related posts (Tpostnum), the logarithm of one plus the total number of company-related comments (Commentnum), the logarithm of one plus the total number of company-related readings (Readnum) and the logarithm of one plus Web search volume index (SVI), respectively. All regressions control for firm and year fixed effects. We report robust t-statistics in parenthesis, while ***, **, * denote statistical significance at 1%, 5%, and 10% level, respectively.

Table 11. Heterogeneous: Industry pollution degree

Dependent Variable	*IDR*							
	Pollution = 1				*Pollution = 0*			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
GP	-0.0026				0.0317 ***			
	(-0.21)				(4.07)			
GPN		-0.0007				0.0321		
		(-0.06)				(4.19)		
GPI			0.0071				0.0224 ***	
			(0.62)				(3.25)	
GPIN				0.0102				0.0223 ***
				(0.93)				(3.35)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES	YES	YES
Firm fixed effect	YES	YES	YES	YES	YES	YES	YES	YES
ADJ-RSQ	0.47	0.47	0.47	0.47	0.49	0.49	0.49	0.49
Observations	3,652				8,848			

Notes: This table presents the results of heterogeneous effects. For each model, the dependent variable is the information disclosure rating. Models 1-4 show the estimation results for the heavily polluting industries, and Models 5-8 show the estimation results for the non-heavily polluting industries. Model 1-4 (Model 5-8) report the results for the logarithm of one plus the number of green patents applications (GP), the logarithm of one plus the number of green patents granted (GPN), the logarithm of one plus the number of green invention patent applications (GPI) and the logarithm of one plus the number of green invention patent granted (GPIN), respectively. All regressions control for firm and year fixed effects. We report robust t-statistics in parenthesis, while ***, **, * denote statistical significance at 1%, 5%, and 10% level, respectively.

Table 12. Heterogeneous: Industry competition degree

Dependent Variable	*IDR*							
	Dummy (HHI) = 1				*Dummy (HHI) = 0*			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
GP	0.0107				0.0377 ***			
	(1.23)				(3.46)			
GPN		0.0114				0.0402		
		(1.34)				(3.76)		
GPI			0.0061				0.0333 ***	
			(0.78)				(3.39)	
GPIN				0.0090				0.0352 ***
				(1.19)				(3.71)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES	YES	YES
Firm fixed effect	YES	YES	YES	YES	YES	YES	YES	YES
ADJ-RSQ	0.54	0.54	0.54	0.54	0.56	0.56	0.56	0.56
Observations	7,276				5,224			

Notes: This table presents the results of heterogeneous effects. For each model, the dependent variable is the information disclosure rating. Models 1-4 show the estimation results for competitive industries, and Models 5-8 show the estimation results for non-competitive industries. Model 1-4 (Model 5-8) report the results for the logarithm of one plus the number of green patents applications (GP), the logarithm of one plus the number of green patents granted (GPN), the logarithm of one plus the number of green invention patent applications (GPI) and the logarithm of one plus the number of green invention patent granted (GPIN), respectively. All regressions control for firm and year fixed effects. We report robust t-statistics in parenthesis, while ***, **, * denote statistical significance at 1%, 5%, and 10% level, respectively.