

Article

Influence of Media Attention on the Quality of Environmental, Social, and Governance Information Disclosure in Enterprises: An Adjustment Effect Based on the Shareholder Relationship Network

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Abstract: As an intermediary in information dissemination and a guide of public opinion, the media represent an important external supervision force in corporate governance. It is very important to fully understand the supporting role of public media in the modernization of environmental governance in China to improve the quality of ESG information disclosure. Based on the data of companies listed on the Shanghai and Shenzhen 300 Index from 2015 to 2020, this paper finds that media attention has a significant positive impact on ESG information disclosure, that is, high-frequency media attention can promote the quality of ESG information disclosure, while different types of media reports can promote the quality of ESG information disclosure. Considering the characteristics of media emotions, it is found that negative media reports can promote the quality of ESG information disclosure. The shareholder relationship network strengthens the positive influence of media attention on the ESG information disclosure of enterprises through the information advantage of a “weak relationship”. These research conclusions reveal the internal influence of media attention on the quality of the ESG information disclosure of enterprises and the regulatory role of the shareholder relationship network to some extent, which provides the governance perspective on and empirical basis for ESG information disclosure research, and it also provides a decision-making reference for promoting the quality of the ESG information disclosure of listed enterprises in China, enriching the theoretical research and practical exploration of ESG information disclosure.

Keywords: shareholder relationship network; media attention; ESG information disclosure quality



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1. Introduction

The introduction of ESG disclosure is a behavior and benefit that focuses on three levels of enterprises: environment, society and governance. It is a concrete expression of the long-term value investment concept and an enterprise evaluation standard based on green development. ESG is not a traditional corporate social responsibility but rather a rigorous and quantifiable investment method. With the continuous progress of the capital market and the continuous outbreak of potential risks, ESG investment has gradually become a method to control risks. ESG information disclosure has become an important information basis for measuring the risk status of enterprises, and it is the key data support for building an ESG rating system. As a basic dimension of corporate social responsibility, ESG rating is also one of the important indicators for evaluating the quality of the ESG information disclosure, enterprise potential and sustainable development ability of enterprises) [1,2]. In May 2022, the State-owned Assets Supervision and Administration Commission of the State Council in China promulgated the Work Plan for Improving the Quality of Listed Companies Controlled by Central Enterprises, emphasizing that the state-owned holding enterprises of central enterprises should actively participate in the establishment

of ESG systems with Chinese characteristics, such as ESG information disclosure rules, ESG performance ratings and ESG investment guidelines. Under the joint promotion of regulatory policies and the goal of “double carbon”, Chinese enterprises must attach importance to ESG management to achieve sustainable green development and economic growth, and ESG information disclosure has become an important link. By the end of June 2023, nearly 50% of listed companies in China had disclosed their 2022 ESG-related reports, and about 12% of the companies in the A-share market had an ESG rating of Grade A or above, which was still far from advanced regions such as Europe and America. Although China has issued ESG-related guidelines and policies, the standards of ESG information disclosure are still unclear and inconsistent, and the ESG information disclosure of different industries and enterprises shows great differences, which cannot meet the requirements of public supervision. It is particularly important to speed up the improvement of the ESG information disclosure quality of listed companies in China.

At present, the research concerning the influence of ESG information disclosure quality is mainly reflected in government interventions, reputation mechanisms and executive characteristics. The regulatory pressure of local governments can significantly promote the information disclosure of state-owned enterprises [3]. Institutional constraints and active policies can also significantly promote the willingness of companies to disclose environmental information and the quality of the disclosure [4,5]. However, supervision is still a long-term solution to promote the disclosure of the social responsibility information of listed companies [6,7]. In addition, the intrinsic incentive of corporate reputation can also significantly affect the level of environmental information disclosure [8,9]. The gender, age and education level of senior executives play a moderating role in the impact of institutional pressure on environmental information disclosure [10]. According to the information transmission theory and stakeholder theory, if an enterprise is exposed by the media as exhibiting behaviors that cause substantial damage to stakeholders, its reputation will be reduced. As an important source of information for stakeholders to understand and supervise the operating conditions of enterprises, media reports can not only reduce the information asymmetry but also make up for the shortcomings of the legal policy system and give play to the functions of social supervision and external governance. Related research also reveals the governance effect of media attention on the supervision and disclosure mechanism, reputation mechanism and market pressure mechanism [11,12]. It can be seen that media attention affects corporate governance through supervision, reputation and pressure mechanisms, and the relevant literature in the previous article shows that these mechanisms are also important factors affecting the quality of ESG information disclosure. Accordingly, from the perspective of the social supervision function and external governance, this paper combs the internal relationship between media attention and the quality of enterprises' ESG information disclosure, and it mainly discusses the following two questions: (1) As an intermediary in information dissemination and a guide of public opinion, the media fulfills the role of social supervision. Can media attention really promote the quality of enterprises' ESG information disclosure? (2) In China's A-share market, a social network connection formed by shareholders has become very common. The shareholder relationship network is an important resource for corporate reputation, information and social capital. The more critical the shareholder relationship network is, the more attention will be paid to reputation management. From the perspective of external governance, what role does the shareholder relationship network play between media attention and the quality of ESG information disclosure?

In view of the above two problems, this paper takes listed companies in China as the research object and adopts the linear regression analysis method to establish the relationship model among the shareholder relationship network, media attention and ESG information disclosure quality of enterprises, trying to reveal the influence of different types of media attention and media emotions on the ESG information disclosure quality of enterprises and the moderating effect of the shareholder relationship network, so as to provide a media attention governance perspective and an empirical basis for the research concerning

ESG information disclosure quality, and also to provide a decision-making reference for improving the ESG information disclosure quality of listed companies in China.

The contribution of this paper is reflected in three aspects: ① From the perspective of media attention governance, this paper discusses the influence of different types of media and media emotions on the quality of the ESG information disclosure of enterprises. There are many factors influencing the quality of ESG information disclosure. Based on the relevant research, this paper systematically combs the theoretical relationship between different types of media and media emotions and the quality of ESG information disclosure and makes an empirical test that improves the research on the quality of ESG information disclosure from the perspective of media attention. ② To explore the moderating effect of the shareholder relationship network and further enrich the research on the influence of ESG information disclosure quality. The resource effect and information advantage of the social network relationship cannot be ignored. In this paper, the shareholder relationship network is brought into the research framework of ESG information disclosure quality and the regulatory effect of the shareholder relationship network is studied based on the social network analysis method, further enriching the relationship between media attention and the ESG information disclosure quality of enterprises. ③ To provide a theoretical and practical reference for improving the quality of the ESG information disclosure of enterprises in China. This paper provides a theoretical and empirical basis for improving the quality of the ESG information disclosure of listed companies in China from the perspective of media attention, and it also provides a theoretical and practical reference for China to formulate ESG reporting policy guidelines while giving full play to the function of media attention in supervising and managing the sustainable development of enterprises.

The rest of this paper is structured as follows: The second part puts forward the theoretical hypothesis concerning the relationship among the shareholder relationship network, media attention and the quality of ESG information disclosure. The third part collects the relevant data involved in the research, selects the variables for the research questions and constructs the relevant linear regression equation. The fourth part analyzes the empirical results of the relevant regression equation and tests the research hypothesis. The fifth part further discusses the relationship between media attention and the quality of enterprises' ESG information disclosure and the moderating effect of the shareholder relationship network on the quality of enterprises' ESG information disclosure. The sixth part is the research conclusions, management enlightenment and future prospects of this paper.

2. Literature Review and Research Hypothesis

2.1. The Impact of ESG Information Disclosure Quality

ESG is a new investment concept and enterprise evaluation standard that focuses on the environmental, social and governance performance of enterprises. ESG is an investment concept used to evaluate enterprises' social responsibility and sustainable development, and it is an important part of the concept system of green finance [13]. Drempetic et al. (2020) pointed out that when enterprises actively engage in ESG-related activities and disclose information on time, it is conducive to the sustainable development of enterprises. ESG investors are more concerned about the value of information disclosure, so enterprises should pay more attention to the management and scoring of the environment, social responsibility and corporate governance [14]. Some scholars also emphasized that the frequency, quantity, method and quality of ESG information disclosure will have a certain impact on enterprise value. In the long run, the content of ESG information disclosure will have a significant positive impact on enterprise performance [15–17].

There are many factors that affect the quality of ESG information disclosure, mainly related to government intervention, market supervision, reputation mechanism and internal governance. In terms of government intervention, legal restraint has become the main measure, and relevant legal provisions are an important consideration for corporate social responsibility information disclosure [18]. Mei Xiaohong (2020) found that government

supervision can effectively prompt enterprises to disclose ESG information, and this effect is more significant in private enterprises [19], and Tang Y (2020) [3] and Krueger P (2021) [20]. The conclusion of such research is similar, and this conclusion has also been verified by enterprises in EU countries [21]. In terms of market supervision, Wang Lei et al. (2019) concluded that the number, proportion and portfolio concentration of supervised institutional investors boycotted through pressure can promote the quality of corporate environmental information disclosure [22]. Relevant empirical research also showed that when the Shanghai–Shenzhen Stock Connect system is implemented in the market, the quality of environmental information disclosure in China’s stock market can be significantly improved, while the enthusiasm and accuracy of the voluntary disclosure of information by companies have been improved [23,24]. In addition, Pedersen et al. (2021) concluded that foreign institutional investors can promote the disclosure of corporate social responsibility information based on the background research of listed companies in China, and investors will also take ESG perspective into account in their investment decisions, thus promoting good corporate behavior [25]. In terms of the reputation mechanism, corporate reputation interacts with the quality of ESG information disclosure [8,9]. This mechanism will also cause a market reaction. Passing on good news can reduce the positive reaction of the market, while passing on bad news will increase the negative reaction of the market [26]. In terms of internal governance, the ESG information disclosure of enterprises not only has to comply with the guidelines and policy responses of national regulatory authorities and relevant ministries and commissions but also to safeguard stakeholders’ right to know the internal information of the company, so as to achieve the purpose of maintaining corporate reputation, attracting external investors and enhancing corporate value. Li Zhibin and Zhang Tiesheng (2017) concluded that internal control can significantly improve the quality of social responsibility information disclosure, and this effect is more intense in non-state-owned enterprises [27]. However, under a high agency cost, the quality of corporate environmental information disclosure will decline, and the hometown feelings and marketization process of corporate management can negatively regulate it [28]. García-Sánchez et al. (2020) and Saraswati et al. (2022) also came to the conclusion that the top management team will influence the quality and detail of ESG information disclosure [29,30].

On the whole, the related research shows that the proper promotion of ESG performance and information disclosure is beneficial to the growth of an enterprise’s own value, and there are many factors that affect the quality of ESG information disclosure, such as government intervention, market supervision, reputation mechanism and the internal governance of enterprises, involving information transmission, market reaction and stakeholders. The combining of the relevant literature provides a theoretical basis for the study of the relationship between media attention and ESG information disclosure quality.

2.2. *The Relationship between Media Attention and ESG Information Disclosure Quality*

The media represent the main intermediary in social information dissemination, that is, propaganda platforms or circulation media. From the type point of view, the media can be divided into network media, newspaper media, financial media and non-financial media, and they can also be divided into policy-oriented media and market-oriented media. The governance effect of media attention is reflected in the supervision and disclosure mechanism, reputation mechanism and market pressure mechanism [11,12]. In terms of the supervision and disclosure mechanism, media reports will attract the attention of administrative supervision departments and institutions, such as the government, and then fulfill the role of supervision and management. Miller (2006) explained the supervision and disclosure function of the media [31]. Lu Dong et al. (2015) studied the influence of different types of media on the internal control of enterprises from the perspective of external supervision [32]. In addition, Zhou Kaiguo and others (2016) concluded through empirical research that media supervision can effectively reduce the number of violations by listed companies, and the more companies that violate the law, the more significant the governance effect of media supervision will be [33]. Wu Xiancong and Zheng Guohong

(2021) also proved that the news media's close attention to enterprises can reduce the illegal reduction of major shareholders, and the effect of negative media reports is more obvious [34]. In terms of the reputation mechanism, media reports will attract social attention, thus affecting corporate image and then promoting the improvement of corporate behavior. Dai et al. (2015) concluded that media reports can amplify shareholders' behavior, while major shareholders often maintain the image of the company and individuals by being cautious [35]. Baloria et al. (2018) believed that corporate reputation is very important to maintain profitability, and the media can impose reputation costs on companies through information intermediary and negative reports [36]. Zhao Li and Zhang Ling (2020) also concluded that negative media reports can have adverse effects on corporate image, management reputation and product market sales in a short time, forcing enterprises to accelerate measures to improve the environment in order to reverse public opinion [37]. In terms of the market pressure mechanism, the more media attention an enterprise receives, the greater the pressure it has to fulfill ESG information disclosure. Ying Qianwei et al. (2017) discussed media attention under the influence of the market pressure effect and its transmission mechanism. The empirical results showed that higher media attention can bring more investors' attention and then generate certain market pressure [38]. Wang Fusheng and others (2022) concluded that enterprises will be forced by the market pressure of media attention to achieve more earnings management to meet market expectations [39].

According to the theoretical literature on the influence of ESG information disclosure quality, the governance effect of media attention and the influence of ESG information disclosure quality have similarities in terms of the supervision mechanism, reputation mechanism and market pressure mechanism, which determine the internal relationship between them. Based on the supervision mechanism, media attention has a natural external supervision and management function, and media reports can make up for the lack of legal constraints to a certain extent and urge enterprises to do a good job of social responsibility and governance, although excessive media attention can lead to increased anxiety among employees, which is not conducive to their work enthusiasm [40]. The media, in the backlog of the COVID-19 panel, can enhance corporate social responsibility [41]. Based on the reputation mechanism, enterprises maintain and improve their good social image and reputation by actively responding to media and social concerns, restraining their own behaviors, reducing illegal events, strengthening environmental protection, fulfilling social responsibilities, and disclosing corporate governance. Based on the market pressure mechanism, media attention will lead to pressure on enterprise managers in many aspects, such as performance, environmental protection, enterprise innovation, public opinion, social responsibility, internal governance, etc. The higher the media attention, the more motivated enterprises will be to disclose higher-quality ESG information in order to achieve the purpose of improving the level of social responsibility, environmental governance and internal governance. In addition, relevant empirical evidence also shows that a higher level of media attention can promote a higher quality of environmental information disclosure [42,43]. There is a positive correlation between media coverage and corporate information disclosure [44]. Media attention can reduce the degree of information asymmetry, thus generating the governance effect of the media and urging enterprises to fulfill their social responsibilities [45,46]. Therefore, the more media attention an enterprise receives, the more comprehensive its ESG information disclosure will be, thus improving the quality of ESG information disclosure. The following assumption is put forward:

H1: *Media attention can have a significant positive impact on the quality of the ESG information disclosure of listed companies.*

2.2.1. The Relationship between Media Types and ESG Information Disclosure Quality

According to the nature of the media, this paper divides the media into network media, policy-oriented media and market-oriented media. Policy-oriented media with official colors have the requirement to disclose information to the securities market and undertake the obligation to convey policy guidance, and the contents disclosed will inevitably attract

the attention of listed companies and regulatory agencies. If enterprises are concerned by policy-oriented media, it is easier to attract the attention of administrative supervision departments. Market-oriented media are more inclined to expose negative news such as corporate violations. However, listed companies often pay attention to the control of their own negative news. Compared with market-oriented media, policy-oriented media can bring more pressure to listed companies. The popularity of the Internet leaves people more exposed to online media, and the content is broader and richer. Network media cover a wide range, covering multiple network media platforms, and information can be quickly transmitted to every corner of the Internet. The pressure on and reputation crisis of enterprises are often caused by online media reports and public opinion. Xiao Hongjun et al. (2022), taking artificial intelligence enterprises as samples, concluded that media attention can promote the fulfillment of corporate social responsibility, and policy-oriented media have a greater influence than market-oriented media [47]. Most scholars believe that online media, policy-oriented media and market-oriented media all have positive effects, although their effects are different [32,48]. It can be seen that different media types have different influences on enterprises, and the resulting reputation mechanism and pressure mechanism have different governance effects. Based on this, the following assumption is put forward:

H2: *Network media, policy-oriented media and market-oriented media all have a positive impact on the quality of the ESG information disclosure of listed companies and are heterogeneous.*

2.2.2. The Relationship between Media Emotions and ESG Information Disclosure

Media emotions can be divided into positive media emotions, negative media emotions and neutral media emotions. The positive mood of the media will often aggravate the contradiction between principal and agent, thus reducing the management level of enterprises. The positive mood of the media will reduce the market pressure on enterprises, which will then ignore ESG information disclosure. Market pressure often comes from the dissatisfaction of stakeholders and negative media reports, and negative media emotions can make enterprises face great social pressure. Under heavy pressure, enterprises can often respond to social concerns and pay attention to issues that concern stakeholders and the media more quickly and efficiently, so as to better fulfill the responsibility of ESG information disclosure and seek the sustainable development of enterprises. In empirical research, most scholars believe that negative media emotions can affect corporate governance, information quality, illegal behavior, corporate image and decision-making [34,36,37,49,50]. Therefore, this paper puts forward the following assumption:

H3: *Negative media emotions can promote the quality of the ESG information disclosure of listed companies.*

2.3. Relationship between Shareholder Relationship Network and ESG Information Disclosure Quality

2.3.1. The Regulatory Role of the Shareholder Relationship Network

A social network can bring potential value to enterprises, which is embodied in reducing information asymmetry, exchanging economic benefits, enhancing enterprise value, exchanging resources and information advantages [51]. Granovetter (1973) distinguished the nature of a social network between a “strong relationship” and a “weak relationship” and measured the strength of the relationship from four aspects: the degree of acquaintance, the frequency of communication, the content of confession and reciprocal behavior [52]. In a “strong relationship”, the two sides of the relationship invest more emotions and are closely connected, and there will be frequent reciprocal help. In the “weak relationship”, although the two sides of the relationship are far away, they still act as information bridges and then connect with different subjects to obtain rich information and higher information value. Shareholders are the most direct and important stakeholders of an enterprise, and they are also the most concerned about the business performance, reputation value and investment

value of the enterprise. Common shareholders can form a shareholder relationship network, and the formed “bridge” can provide rich, diversified and heterogeneous information to enterprises. A “strong relationship” may bring resources and human feelings, while a “weak relationship” provides information, and obtaining high-value information makes enterprise decision-making more flexible. In the theoretical and practical research, most people talk about “information superiority” without distinguishing between a “strong relationship” and a “weak relationship”. The advantages of resources and information brought by shareholders’ social network can affect enterprise value and enterprise innovation to a certain extent, and they can then promote enterprises’ ESG performance and obtain investment value. The information resources owned by shareholders can help enterprises to capture the trend of media reports to a certain extent and carry out reputation risk management, early warning and post-event management of negative events. At the same time, they can make use of the resource advantages of the shareholder relationship network to release good news, ease media emotions and respond to the needs of stakeholders [50]. Although there is no literature on the relationship between the shareholder relationship network and ESG information disclosure, it has been proved that the shareholder relationship network can affect enterprise performance and enterprise innovation [53–55]. These two factors can affect the performance of ESG disclosure, so it can be seen that the moderating effect of the shareholder relationship network on the quality of ESG information disclosure is theoretically established, which provides a reference for this study. Accordingly, this paper puts forward the following assumption:

H4: *The shareholder relationship network can significantly strengthen the positive impact of media attention on the quality of the ESG information disclosure of listed companies.*

2.3.2. The Resource Effect of a “Strong Relationship” or the Information Advantage of a “Weak Relationship”

In China, most listed companies are “enterprise groups”, forming a relationship network centered on the head office, which is a special case of a “shareholder relationship network”. In the study of enterprise groups, enterprise groups are considered as internal capital markets that can flexibly allocate group resources and generate economic benefits, reduce the risks of group members, assume the role of risk sharing and provide credit guarantees. By sharing risks and credit guarantees, group members can resolve enterprise crises and realize economic benefits. This is a resource effect of a “strong relationship”. The “information bridge” composed of common shareholders can convey a large amount of highly efficient and diversified differentiated information, forming the information advantage of a “weak relationship”. There is a “strong relationship” between shareholders and enterprises, which does not rule out a “weak relationship” between institutional investors and companies. However, enterprises may only form a “weak relationship” unless they are an enterprise group. Based on the above analysis, there are two possibilities for the influence mechanism of the shareholder relationship network, one is the resource effect of a “strong relationship” and the other is the information advantage of a “weak relationship”. The resource advantage of a “strong relationship” is only the influence of the small network of enterprise groups, and whether it dominates the shareholder relationship network needs to be verified. The information advantage brought by a “weak relationship” can affect the response of enterprises to media attention to a certain extent, deepen the positive performance of enterprises in terms of environment, society and governance, and safeguard their good reputation and corporate image. In order to strengthen the construction of their own ESG information disclosure, enterprises are bound to carry out the reform of corporate governance, the innovation of environmental protection and the fulfillment of social responsibilities. The information advantages brought by the shareholder relationship network can make enterprises’ actions predictable, preventive, flexible and forward-looking, and they can strengthen their ability to cope with media reports and enhance the forward-looking construction of their own ESG information disclosure. Accordingly, this paper puts forward the following assumptions:

H5a: The positive regulatory effect of the shareholder relationship network on the media attention and the quality of the ESG information disclosure of listed companies mainly comes from the resource effect of a “strong relationship”.

H5b: The positive regulatory effect of the shareholder relationship network on the media attention affecting the quality of the ESG information disclosure of listed companies mainly comes from the information advantage of a “weak relationship”.

Based on the above analysis, the theoretical framework of this paper is as shown in Figure 1.

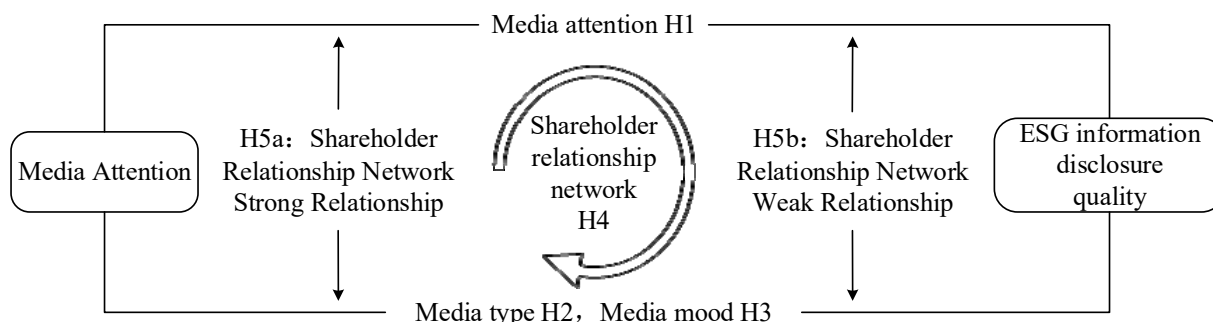


Figure 1. Theoretical relationship model.

3. Methodology

3.1. Variable Measurement

3.1.1. Media Attention: Independent Variable

This paper draws lessons from Li Peigong and Shen Yifeng (2010) [48] and Dai Yiyi (2011) [56]. With reference to the latest media catalogue published by the Securities Regulatory Commission that meets the information disclosure standards of the securities market, this paper selects seven news reports from the *Securities Times*, *Financial Times*, *China Daily*, *Shanghai Securities News*, *China Securities Journal*, *Securities Daily*, *Economic Information Daily* and internet websites run by the above media according to law as the data sources for policy-oriented media. In this paper, the news reports of four leading financial newspapers, *21st Century Business Herald*, *Economic Observer*, *China Business News*, are taken as the data sources for market-oriented media. The attention of online media is obtained by the number of online media news reports with high activity, and this index is sorted through certain manual screening. For the data concerning media emotional attention, this paper refers to Shen Yan (2021) [57]. Using the Python text sentiment analysis method, this paper performs a sentiment analysis on the annual news media reports for sample companies in the CSMAR database, constructs a news text sentiment index, and identifies negative emotional media reports, positive emotional media reports and neutral reports. Refer here to Liu Ji and Gu Fengyun’s (2022) [58] and Zhou Ning et al.’s (2022) [59] methods: The Bert model was used to extract the emotional features of the text, and a text emotional classification model was trained to classify the text.

3.1.2. ESG Information Disclosure Quality: Dependent Variable

The quality of ESG information disclosure is generally reflected by the ESG rating. This paper uses the ESG rating of the Bloomberg database to represent this variable. According to the relevant data concerning ESG in the Bloomberg database, it is divided into the comprehensive score ESG and sub-scores ESG_E, ESG_S and ESG_G. The comprehensive score of ESG is calculated from 3 sub-scores, 21 sub-items and 122 specific indicators according to the corresponding weights. The environmental sub-item (ESG_E) consists of seven items: air quality, climate change, ecological and biodiversity impacts, energy, materials and waste, environmental supply chain and water resources. The social sub-item (ESG_S) consists of six items: community and customers, diversity, ethics and compliance, health and safety,

human capital (HSGIn capital) and social supply chain. The governance sub-item (ESG_G) consists of audit risk and oversight, board composition, welfare (compensation), diversity, independence, nomination and governance supervision (nominations and governance oversight), sustainable governance (sustainability governance) and the duration of the board of directors (duration). In this paper, the comprehensive score is used to measure the ESG rating performance. The larger the index, the better the ESG performance of the enterprise. The ESG composite score calculation model is as follows:

$$ESG_E = \omega_1 Air\ Quality + \omega_2 Climate\ Change + \omega_3 Ecological\ \&\ Biodiversity\ Impacts + \omega_4 Energy + \omega_5 Materials\ \&\ Waste + \omega_6 Supply\ Chain + \omega_7 Water \quad (1)$$

$$ESG_S = \omega_1 Community\ \&\ Customers + \omega_2 Diversity + \omega_3 Ethics\ \&\ Compliance + \omega_4 Health\ \&\ Safety + \omega_5 Human\ Capital + \omega_6 Supply\ Chain \quad (2)$$

$$ESG_G = \omega_1 Audit\ Risk\ \&\ Oversight + \omega_2 Board\ Composition + \omega_3 Compensation + \omega_4 Diversity + \omega_5 Independence + \omega_6 Nominations\ \&\ Governance\ Oversight + \omega_7 Sustainability\ Governance + \omega_8 Tenure \quad (3)$$

$$ESG = AVERAGE(ESG_E + ESG_S + ESG_G) \quad (4)$$

3.1.3. Shareholder Relationship Network: Regulating Variable

For the measurement of the shareholder relationship network, this paper uses the social network analysis software Pajek 5.0 to construct and calculate the index. Learning from Huang Can (2019) [51], Luo Dongliang (2022) [55] and Peng Zhengyin (2022) [60], the method of calculating the social network centrality is used to calculate the shareholder relationship network centrality, which is divided into the degree centrality, close centrality and between centrality.

$$Degree_{k,t} = \frac{\sum_j X_{i,j,t}}{n-1} (i \neq j) \quad (5)$$

In Formula (5), i represents the shareholder of sample company k , while j represents other shareholders except this shareholder in the t year. $X_{i,j,t}$ represents the network connection relationship. If shareholder i and shareholder j jointly hold the same listed company in the t year, then $X_{i,j,t}$ is 1; otherwise, it is 0. Regarding $Degree_{k,t}$, the bigger it is, the more shareholder relationships are involved in company k in the t year and the more central it will be in the network.

$$Close_{k,t} = \frac{|G_{i,t}| - 1}{\sum_{j \in G_{i,t}, j \neq i} d(i, j)} \quad (6)$$

The close centrality of an enterprise refers to the reciprocal of the average shortest distance from each node of the enterprise to the enterprise. The greater the index, the higher the closeness of the enterprise members connected to the network, the closer the position of the enterprises and shareholders in the network, and the information and resources of other nodes can be received by enterprises faster and more efficiently. In Formula (6), $G_{i,t}$ represents the set of connected subnetworks where enterprise k is located in the t year, $|G_{i,t}|$ represents the number of all stages of a connected subnetwork, and $d(i, j)$ represents the shortest path length from node j to node i of a connected subnetwork.

$$Between_{k,t} = \sum_{c, j \in G_{i,t}} \frac{\sigma(c, f|i)}{\sigma(c, f)} \quad (7)$$

The intermediary centrality of enterprise k refers to the fact that in the shareholder relationship network, the nodes that are not directly related are connected through the node of bank k , which reflects the role of the shareholders of enterprise k as an “information bridge” in the shareholder relationship network. The greater this index, the higher the information transmission and control benefits of enterprise k are.

3.1.4. Control Variables

This article refers to Qi Dong (2015) [32], Xiao Hongjun (2022) [47] and other scholars' related research to set control variables from the aspects of enterprise operation status, profitability, growth ability, solvency and so on to ensure the accuracy of the research results. Specific variables are defined in Table 1.

Table 1. Variable definition table.

Variable	Name	Symbol	Definition
Dependent variable	ESG information disclosure quality	ESG	ESG rating, obtained through Bloomberg database
Independent variable	Media attention	Media	Total number of media reports
	Network media reports	Media-W	Total number of online media reports
	Policy-oriented media coverage	Media-Z	Total number of policy-oriented media reports
	Market-oriented media reports	Media-S	Total number of market-oriented media reports
	Negative emotional media reports	Media-X	The total number of negative emotional media reports is obtained by Python text emotion analysis
	Positive emotional media coverage	Media-J	The total number of positive emotional media reports is obtained by Python text emotion analysis
	Neutral emotional media coverage	Media-M	The total number of neutral emotional media reports is obtained by Python text emotional analysis
Regulated variable	Degree centrality	Centrality-D	Measure the central position of the enterprise shareholder relationship network, which is calculated via Pajek software
Control variable	Tight centrality	Centrality-C	Measure the tightness of the enterprise shareholder relationship network, which is calculated via Pajek software
	Intermediary centrality	Centrality-B	The function of the “information bridge” to measure the enterprise shareholder relationship network is calculated via Pajek software
	Institutional investor shareholding ratio	Inst	Proportion of shares of listed companies held by institutional investors
	Combination of two jobs	Dual	The chairman and CEO are concurrently employed, which is 1, not 0
	Independent director ratio	Ind	Ratio of the number of independent directors to the size of directors
	Profitability	ROE	Average balance of net profit/shareholders' equity
	Growth ability	Growth	Operating income growth rate
	Book to market ratio	MtB	Shareholders' equity/company market value
	Currency ratio	Cash	Closing balance of cash and cash equivalents/current liabilities
	Asset-liability ratio	Debt	Total liabilities/total assets
	Tangible assets ratio	Tar	Proportion of tangible assets to all assets
	Tobin q value	Tq	Market capitalization A/total assets
	Nature of the property right	Prn	1 for state-owned enterprises and 0 for non-state-owned enterprises
	Industry virtual variable	Industry	
	Annual dummy variable	Year	

3.2. Data Source

According to the ESG Development Report of Listed Companies in China 2022, the ESG information disclosure rate of A-share listed companies in China has been increasing year by year in recent years. In 2022, 35% of A-share listed companies published ESG-related reports, although this is still a low level of disclosure. In 2022, the disclosure rate of ESG reports by listed companies on the Shanghai and Shenzhen 300 exceeded 90%, far exceeding the 35% of A-share listed companies, and the listed companies on the Shanghai and Shenzhen 300 were authoritative and representative. Generally speaking, it is a large-scale company with a long listing time, large stock liquidity and normal operation. Therefore, this paper takes the companies listed on the Shanghai and Shenzhen 300 Index from 2015 to 2020 as the research sample, eliminates the companies with incomplete data to ensure the consistency of the data, and carries out Winsorized tail reduction on the continuous data with the standard of 1%. The main data sources are as follows:

1. The quality of the ESG information disclosure is obtained through the ESG rating information in the Bloomberg database. The main ESG information data come from publicly disclosed information of the company, such as ESG reports, CSR reports, annual filings, power of attorney, corporate governance reports, and company websites. The Bloomberg ESG disclosure score includes three pillars: E, S, and G, which are divided into different themes and fields. The theme score is calculated based on the scores and weights of different fields, and the theme score is ultimately calculated as the pillar score. Based on the scores of the E, S, and G pillars, the final ESG score is formed.
2. Media attention data are mainly obtained via Python text sentiment analysis technology. The basic data are downloaded from the news section of the CSMAR database.
3. The shareholder relationship network data are mainly calculated via the social network analysis method and using Pajek software. The basic data are the data of the top ten shareholders in the CSMAR database.
4. The control variables and other data are downloaded from the tidal information network and CSMAR database.

3.3. Model Building

According to the nature of the data, the fixed effect regression model in panel data analysis is used to test the relationship among the shareholder relationship network, media attention and ESG information disclosure of listed companies. Firstly, the relationship between media attention and the ESG information disclosure quality of listed companies is tested to verify Hypothesis H1, and the model is set as follows:

$$ESG_{i,t} = \alpha_0 + \beta_1 Media_{i,t} + \beta_2 Controls_{i,t} + \beta_3 Industry_{i,t} + \beta_4 Year_{i,t} + \varepsilon_{i,t} \quad (8)$$

In model (8), ESG is the quality of the enterprise's ESG information disclosure, Media is the media attention index, Controls is the control variable, Industry is the industry fixed effect, Year is the year fixed effect, and ε is the random disturbance term, and the same symbols in the following represent the same variables. Secondly, it examines the relationship between media types and media emotions and the quality of the ESG information disclosure of listed companies, which is used to verify Hypotheses H2 and H3. The model is set as follows:

$$ESG_{i,t} = \alpha_0 + \beta_1 Media - \frac{W_{i,t}}{Media} - \frac{Z_{i,t}}{Media} - S_{i,t} + \beta_2 Controls_{i,t} + \beta_3 Industry_{i,t} + \beta_4 Year_{i,t} + \varepsilon_{i,t} \quad (9)$$

$$ESG_{i,t} = \alpha_0 + \beta_1 Media - \frac{X_{i,t}}{Media} - \frac{J_{i,t}}{Media} - M_{i,t} + \beta_2 Controls_{i,t} + \beta_3 Industry_{i,t} + \beta_4 Year_{i,t} + \varepsilon_{i,t} \quad (10)$$

In model (9), Media-W is the network media report, Media-Z is the policy-oriented media report, and Media-S is the market-oriented media report. In model (10), Media-X is

the negative emotional media report, Media-J is the positive emotional media report, and Media-M is the neutral emotional media report. The definitions of the other variables are the same as above. Finally, the regulatory function of the shareholder relationship network is tested to verify Hypotheses H4 and H5, and the model is set as follows:

$$ESG_{i,t} = \alpha_0 + \beta_1 Media + \beta_2 Centrality_{i,t} + \beta_3 Centrality_{i,t} \times Media_{i,t} + \beta_4 Controls_{i,t} + \beta_5 Industry_{i,t} + \beta_6 Year_{i,t} + \varepsilon_{i,t} \quad (11)$$

$$ESG_{i,t} = \alpha_0 + \beta_1 Media + \frac{\beta_2 CentralityT_{i,t}}{CentralityR_{i,t}} + \frac{\beta_3 CentralityT_{i,t}}{CentralityR_{i,t}} \times Media_{i,t} + \beta_4 Controls_{i,t} + \beta_5 Industry_{i,t} + \beta_6 Year_{i,t} + \varepsilon_{i,t} \quad (12)$$

In model (11), Centrality is the centrality of the shareholder relationship network, including Centrality-D, Centrality-C and Centrality-B, and in model (12), centrality includes the Centrality-T of the top n shareholder relationship networks and CentralityR of the bottom n shareholder relationship networks. The definitions of the other variables are the same as before.

4. Empirical Results Analysis

4.1. Descriptive Analysis

In this paper, the descriptive statistics of the whole sample of data from 2015 to 2020 are determined. After excluding the samples with missing values, 498 observed values are finally obtained. The descriptive statistics of the samples are shown in Table 2. Generally speaking, the ESG level of the sample enterprises is obviously different, and the degree of media attention between the enterprises is quite different. There are many nodes in the enterprise shareholder relationship network, and the network relationship is complex.

Table 2. Descriptive statistics of the full sample.

Variable	Obs	Mean	Std. Dev.	Min	Max
ESG	498	30.762	10.109	10.744	60.744
Media	498	96.518	113.955	9	730
Media-W	498	5.924	10.334	0	62
Media-Z	498	46.6	42.226	4	297
Media-S	498	16.671	31.707	0	221
Media-X	498	3.323	8.99	0	75
Media-J	498	3.546	6.83	0	47
Media-M	498	89.801	102.944	7	668
CentralityDT10	498	328.47	131.847	6	571
CentralityCT10	498	0.002	0.002	0	0.011
CentralityBT10	498	0.746	0.099	0.409	0.863
Inst	498	68.28	19.356	12.741	97.533
Dual	498	0.221	0.415	0	1
ROE	498	0.13	0.090	−0.146	0.367
Growth	498	0.147	0.233	−0.4	1.12
Ind	498	40.536	9.037	21.053	80
MtB	498	0.702	0.322	0.087	1.24
Cash	498	0.149	0.116	0.011	0.588
Debt	498	0.519	0.184	0.046	0.828

4.2. Correlation Analysis

In this paper, the correlation of the main indicators is tested, and the results are shown in Table 3. According to the correlation results in Table 3, there is a positive correlation between media attention and the ESG information disclosure quality of enterprises at the level of 1% significance, which preliminarily verifies Hypothesis H1 of this paper. There is a positive correlation between the degree centrality of the top ten shareholder relationship networks and media attention at a significance level of 5%, which preliminarily verifies that the corporate shareholder relationship networks have a positive regulatory effect on

media attention and ESG information disclosure quality. There is a positive correlation between the institutional investors' shareholding ratio, book-to-market ratio and asset-liability ratio and the quality of ESG information disclosure, which shows that the greater the proportion of institutional investors, the weaker the solvency of enterprises and the stronger the motivation of enterprises to disclose ESG information. The combination of two jobs, profitability, growth ability, the proportion of independent directors and cash ratio are negatively correlated with the quality of ESG information disclosure.

Table 3. Correlation analysis.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ESG	1									
Media	0.146 ***	1								
Cen~DT10	0.186 ***	0.113 **	1							
Inst	0.341 ***	0.024	0.150 ***	1						
Dual	−0.107 **	0.069	−0.126 ***	−0.444 ***	1					
ROE	−0.153 ***	0.130 ***	0.069	−0.097 **	0.044	1				
Growth	−0.096 **	−0.043	−0.066	−0.143 ***	0.117 ***	0.312 ***	1			
Ind	−0.037	0.067	0.042	0.051	0.082 *	0.030	0.021	1		
MtB	0.417 ***	−0.014	0.139 ***	0.292 ***	−0.190 ***	−0.493 ***	−0.223 ***	0.068	1	
Cash	−0.320 ***	0.144 ***	0.032	−0.095 **	−0.061	0.309 ***	0.098 ***	0.086 *	−0.452 ***	1
Debt	0.300 ***	0.078 *	0.036	0.020	−0.100 **	−0.283 ***	−0.043	0.136 ***	0.611 ***	−0.328 ***

Note: ***, ** and * mean significant at the level of 1%, 5% and 10%, respectively.

4.3. Regression Analysis

4.3.1. Test of the Relationship between Media Attention and ESG Information Disclosure Quality

Substitute the sample data into models (4) and (5) for the fixed effect test to verify Hypotheses H1 and H2. The regression results are shown in Table 4, and the regression results of model (4) are shown in column (1) of Table 4. Media attention is positively correlated with the quality of the ESG information disclosure of enterprises, and the correlation coefficient is 0.016, which is significant at the level of 1%, which verifies Hypothesis H1. The regression results show that when enterprises receive more media attention, they will pay more attention to corporate reputation and sustainable development, thus promoting the quality of ESG information disclosure. The regression results of model (5) are shown in columns (2) to (4) of the table. The results show that at the level of 1% significance, online media reports, policy-oriented media reports and market-oriented media reports are all significantly related to the quality of the ESG information disclosure of enterprises, with correlation coefficients of 0.159, 0.043 and 0.046, respectively. The regression results show that different types of media reports can affect the quality of ESG information disclosure, although the influence is different and the influence coefficient of online media is greater. Under the special market mechanism of our country, the external governance function and governance mechanism of news media are not mature enough, the mechanism of media supervision by public opinion relying solely on the market is limited, and the guidance of policy-oriented media is not strong, which may lead to the small influence coefficient of the two. This regression result verifies Hypothesis H2.

Table 4. Regression results of the relationship between media attention, media type and the ESG information disclosure quality of enterprises.

	(1) ESG	(2) ESG	(3) ESG	(4) ESG
Media	0.016 *** (0.003)			
Media-W		0.159 *** (0.039)		
Media-Z			0.043 *** (0.009)	
Media-S				0.046 *** (0.012)
Inst	0.119 *** (0.027)	0.120 *** (0.027)	0.120 *** (0.027)	0.118 *** (0.027)
Dual	2.187 ** (0.908)	2.358 ** (0.913)	2.234 ** (0.906)	2.309 ** (0.916)
ROE	22.011 *** (5.181)	21.874 *** (5.222)	20.586 *** (5.181)	21.931 *** (5.226)
Growth	−1.296 (1.438)	−1.606 (1.448)	−1.219 (1.437)	−1.374 (1.451)
Ind	−0.024 (0.037)	−0.022 (0.038)	−0.020 (0.037)	−0.024 (0.038)
MtB	12.440 *** (2.001)	12.020 *** (2.010)	12.064 *** (1.988)	11.865 *** (2.008)
Cash	−15.403 *** (3.764)	−14.842 *** (3.788)	−15.763 *** (3.769)	−15.424 *** (3.811)
Debt	18.060 *** (3.152)	18.904 *** (3.163)	18.267 *** (3.137)	19.306 *** (3.149)
_cons	3.105 (3.049)	3.383 (3.075)	2.763 (3.047)	3.748 (3.081)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
N	498.000	498.000	498.000	498.000
F	24.354	23.181	24.495	23.050
r2	0.629	0.623	0.630	0.623

Note: The standard errors in brackets are *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Substitute the sample data into model (6) to test the fixed effect and verify Hypothesis H3. The regression results are shown in Table 5, and columns (1) to (3) in Table 5 are the regression results of model (6). The results show that at the level of 5% significance, positive emotional media reports are significantly related to the quality of the ESG information disclosure of enterprises, with a correlation coefficient of 0.125. There is a significant correlation between negative emotional media reports and the ESG information disclosure quality of enterprises at the level of 10% significance, with a correlation coefficient of 0.067. There is a significant correlation between neutral emotional media reports and the ESG information disclosure quality of enterprises at the 1% significance level, with a correlation coefficient of 0.019. The regression results show that negative media reports can improve the quality of ESG information disclosure, which may be due to the fact that negative media reports reflect the dissatisfaction of investors and the public. This kind of public opinion pressure is much greater than that brought by positive emotions. Enterprises have to engage in some responses and actions to respond to the emotions and concerns of stakeholders, and they then take positive actions to disclose more ESG information and save the good image and reputation of enterprises. Positive emotions can bring good social reputation to enterprises, and enterprises can have more resources to undertake more social responsibilities and carry out ESG management. The regression results verify Hypothesis H3.

Table 5. Regression results of the relationship between media sentiment and the ESG information disclosure quality of enterprises.

	(1) ESG	(2) ESG	(3) ESG
Media-J	0.125 ** (0.055)		
Media-X		0.067 * (0.038)	
Media-M			0.019 *** (0.004)
Inst	0.120 *** (0.027)	0.118 *** (0.027)	0.120 *** (0.027)
Dual	2.682 *** (0.920)	2.688 *** (0.922)	2.152 ** (0.906)
ROE	21.099 *** (5.295)	22.128 *** (5.304)	22.034 *** (5.168)
Growth	−1.799 (1.468)	−1.555 (1.470)	−1.224 (1.435)
Ind	−0.022 (0.038)	−0.021 (0.038)	−0.023 (0.037)
MtB	11.751 *** (2.050)	11.420 *** (2.042)	12.445 *** (1.994)
Cash	−14.682 *** (3.869)	−14.284 *** (3.873)	−15.275 *** (3.750)
Debt	20.274 *** (3.191)	21.106 *** (3.154)	17.849 *** (3.146)
_cons	3.383 (3.116)	3.240 (3.122)	2.984 (3.041)
Industry	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	498.000	498.000	498.000
F	21.361	21.031	24.735
r2	0.614	0.612	0.631

Note: The standard errors in brackets are *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

4.3.2. Test of the Regulatory Function of the Shareholder Relationship Network

Model (7) takes the shareholder relationship network as a moderator variable and tests its moderating effect through the multiplication terms of shareholder relationship network and media attention, including the interaction terms of the degree Centrality-D, tight Centrality-C and intermediary Centrality-B of the shareholder relationship network and media attention. The regression results are shown in Table 6. The correlation coefficients of the intersection terms Centrality-D $\times$ Media and Centrality-B $\times$ Media are not significant, and only the correlation coefficient of the intersection term Centrality-C*Media is positively significant at the level of 1%. The regression results show that the shareholder relationship network has a significant regulatory effect on the media attention and the quality of the ESG information disclosure of enterprises, and this effect is reflected by the close centrality of the shareholder relationship network, which shows that the close relationship between enterprises is the main reason why the shareholder relationship network plays a regulatory role. This may be because the closer the relationship between shareholders, the faster and more reliable the information obtained by enterprises and the more flexible the responses and actions of enterprises. The regression results verify Hypothesis H4.

Table 6. Regression results of the relationship between the shareholder relationship network and the ESG information disclosure of enterprises.

	(1) ESG	(2) ESG	(3) ESG
Media	0.020 *** (0.006)	0.012 *** (0.003)	0.029 ** (0.013)
Centrality-D × Media	−0.000 (0.000)		
Centrality-C × Media		5.719 *** (1.351)	
Centrality-B × Media			−0.018 (0.017)
Inst	0.121 *** (0.027)	0.118 *** (0.026)	0.120 *** (0.027)
Dual	2.120 ** (0.913)	2.281 ** (0.892)	2.066 ** (0.916)
ROE	22.412 *** (5.208)	21.529 *** (5.088)	22.322 *** (5.189)
Growth	−1.328 (1.439)	−1.242 (1.412)	−1.311 (1.438)
Ind	−0.024 (0.038)	−0.016 (0.037)	−0.025 (0.037)
MtB	12.483 *** (2.002)	11.686 *** (1.972)	12.426 *** (2.001)
Cash	−15.189 *** (3.776)	−14.794 *** (3.699)	−15.201 *** (3.769)
Debt	18.148 *** (3.156)	17.412 *** (3.099)	18.200 *** (3.155)
_cons	2.861 (3.067)	3.336 (2.994)	2.968 (3.052)
Industry	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	498.000	498.000	498.000
F	21.960	24.527	22.024
r2	0.630	0.643	0.630

Note: The standard errors in brackets are *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Furthermore, the data are substituted into model (8) to test the resource effect of a “strong relationship” and the information advantage of a “weak relationship” on the shareholder relationship network. In this paper, the resource effect of a “strong relationship” is tested by the network centrality of the top seven, top six, top five and top four shareholders’ relationships, and the information advantage of a “weak relationship” is tested by the network centrality of the last seven, last six, last five and last four shareholders’ relationships. CentralityT7*Media is the intersection of the network centrality and media attention of the top seven shareholder relations, and CentralityR7*Media is the intersection of the network centrality and media attention of the last seven shareholder relations, and so on. The regression results of the influence mechanism of the shareholder relationship network regulation are shown in Table 7, and the results in columns (1) to (8) show that only the coefficient of the intersection between the centrality of the last six shareholder relationship networks and media attention is significant at the 1% level, while the other intersection items are not significant, indicating that the regulatory function of shareholder social networks occurs more through the information advantage of a “weak relationship”. The connection of shareholder relationship networks can bring more information to enterprises, thus promoting media attention on enterprises. The regression results verify Hypothesis H5b, although Hypothesis H5a is not verified.

Table 7. Regression results of the mechanism test of the shareholder relationship network's adjustment effect.

	(1) ESG	(2) ESG	(3) ESG	(4) ESG	(5) ESG	(6) ESG	(7) ESG	(8) ESG
Media	0.019 *** (0.005)	0.018 *** (0.005)	0.015 *** (0.004)	0.015 *** (0.004)	0.018 *** (0.005)	0.011 *** (0.003)	0.019 *** (0.004)	0.016 *** (0.004)
CentralityT7 × Media	−0.000 (0.000)							
CentralityT6 × Media		−0.000 (0.000)						
CentralityT5 × Media			0.000 (0.000)					
CentralityT4 × Media				0.000 (0.000)				
CentralityR7 × Media					−0.000 (0.000)			
CentralityR6 × Media						3.558 *** (1.014)		
CentralityR5 × Media							−0.000 (0.000)	
CentralityR4 × Media								−0.000 (0.000)
Inst	0.120 *** (0.027)	0.121 *** (0.027)	0.118 *** (0.027)	0.118 *** (0.027)	0.119 *** (0.027)	0.117 *** (0.026)	0.119 *** (0.027)	0.119 *** (0.027)
Dual	2.123 ** (0.912)	2.139 ** (0.912)	2.225 ** (0.912)	2.201 ** (0.910)	2.137 ** (0.913)	2.187 ** (0.897)	2.149 ** (0.908)	2.185 ** (0.909)
ROE	22.391 *** (5.202)	22.325 *** (5.208)	21.826 *** (5.200)	21.670 *** (5.246)	22.026 *** (5.185)	21.232 *** (5.122)	22.179 *** (5.179)	22.015 *** (5.186)
Growth	−1.354 (1.440)	−1.353 (1.442)	−1.252 (1.442)	−1.245 (1.444)	−1.270 (1.440)	−1.488 (1.422)	−1.192 (1.439)	−1.285 (1.443)
Ind	−0.023 (0.038)	−0.024 (0.038)	−0.025 (0.038)	−0.024 (0.038)	−0.023 (0.038)	−0.020 (0.037)	−0.022 (0.037)	−0.024 (0.038)
MtB	12.452 *** (2.001)	12.486 *** (2.003)	12.424 *** (2.003)	12.414 *** (2.003)	12.514 *** (2.006)	11.876 *** (1.983)	12.495 *** (2.000)	12.443 *** (2.003)
Cash	−15.106 *** (3.782)	−15.125 *** (3.793)	−15.544 *** (3.779)	−15.533 *** (3.780)	−15.357 *** (3.768)	−15.757 *** (3.719)	−15.706 *** (3.769)	−15.433 *** (3.779)
Debt	18.184 *** (3.157)	18.127 *** (3.156)	17.980 *** (3.159)	17.954 *** (3.165)	18.068 *** (3.155)	17.477 *** (3.118)	18.038 *** (3.150)	18.062 *** (3.156)
_cons	2.862 (3.064)	2.854 (3.077)	3.256 (3.068)	3.280 (3.079)	3.033 (3.054)	3.740 (3.017)	3.042 (3.047)	3.111 (3.053)
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	498.000	498.000	498.000	498.000	498.000	498.000	498.000	498.000
F	21.976	21.928	21.904	21.897	21.920	23.697	22.116	21.872
r2	0.630	0.629	0.629	0.629	0.629	0.639	0.630	0.629

Note: The standard errors in brackets are *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

4.4. Robustness Test

Considering the endogenous problems caused by sample selection bias, two-way causality, omission of important variables and other factors, in order to ensure the reliability of the research results, this paper refers to Wanshouyi and Li Xinli (2016) for the above factors [61]. This method is used for the robustness test, and the substitution variable method, instrumental variable method and propensity score matching method (PSM) are used for the endogenous test and robustness test.

4.4.1. Substitution Variable Method

This paper tests the robustness of the empirical model designed above by replacing key variables. Industry differences are diverse elements in ESG information disclosure and ESG rating, and companies in different industries receive different degrees of media attention. The media often pay more attention to the ESG information disclosure content and ESG performance of enterprises with high pollution and high energy consumption. In this study, the quality of ESG information disclosure and media attention are treated to exclude the influence of system differences in the industry on the empirical results. Specifically, the variables are processed through the annual average of industries except for the enterprise itself. The listed company's ESG information disclosure A_ESG is represented by the difference between the ESG information disclosure and the annual average of the industry except itself, and the media attention A_Media is represented by the difference between the media attention and the annual average of the industry except itself. The regression results are shown in Table 8 below. The media attention after treatment has a significant relationship with the quality of the ESG information disclosure, and the regulatory role of the shareholder relationship network is also significant. Therefore, the results after industry adjustment are still robust, which verifies the robustness of the results in this paper to some extent.

Table 8. Robustness test results: Sample selection bias.

	(1) A_ESG	(2) A_ESG
A_Media	0.019 *** (0.003)	0.015 *** (0.004)
Centrality-C × Media		4.147 * (2.184)
Inst	0.201 *** (0.036)	0.199 *** (0.035)
Dual	3.695 *** (1.224)	3.737 *** (1.220)
ROE	29.989 *** (7.080)	30.044 *** (7.058)
Growth	−1.745 (2.049)	−2.031 (2.048)
Ind	−0.070 (0.051)	−0.068 (0.051)
MtB	20.374 *** (2.684)	20.214 *** (2.677)
Cash	−20.721 *** (5.203)	−20.154 *** (5.196)
Debt	17.607 *** (4.284)	17.650 *** (4.271)
_cons	−36.077 *** (4.185)	−35.996 *** (4.172)
Industry	Yes	Yes
Year	Yes	Yes
N	447.000	447.000
F	26.385	24.257

Note: The standard errors in brackets are *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

4.4.2. Tool Variable Method

In practice, explanatory variables and explained variables may have a certain causal relationship, which makes the research results endogenous. This paper will use the tool variable method to solve the possible endogeneity problems. The lag term of the endogenous variable is very common as an instrumental variable. According to the applicable condition of the lag term as an instrumental variable proposed by Bellemare et al. (2017) [62], this paper selects the lag term of the explanatory variable as an instrumental variable and performs an empirical test by using the data of the one-phase lag and two-phase lag of explanatory variable. Lagging data can weaken the endogeneity problems caused by the interaction between explanatory variables and explained variables. The regression results are shown in Table 9, which shows that the results are still robust after two lag periods.

Table 9. Regression results of the instrumental variable method: Lag test.

	Lag by One Period		Lag by Two Periods	
	ESG	ESG	ESG	ESG
Media1	0.016 *** (0.004)	0.013 *** (0.004)		
Centrality-C × Media1		4.852 *** (1.487)		
Media2			0.019 *** (0.004)	0.016 *** (0.004)
Centrality-C × Media2				4.567 *** (1.609)
Inst	0.142 *** (0.029)	0.138 *** (0.029)	0.164 *** (0.033)	0.160 *** (0.033)
Dual	2.581 *** (0.994)	2.690 *** (0.982)	2.792 ** (1.095)	2.604 ** (1.084)
ROE	22.446 *** (5.677)	22.697 *** (5.605)	24.206 *** (6.668)	24.316 *** (6.589)
Growth	−0.975 (1.607)	−0.908 (1.586)	−1.384 (1.802)	−1.362 (1.781)
Ind	−0.045 (0.041)	−0.037 (0.040)	−0.052 (0.047)	−0.042 (0.046)
MtB	11.454 *** (2.127)	11.137 *** (2.102)	10.976 *** (2.370)	10.518 *** (2.347)
Cash	−15.555 *** (4.172)	−15.636 *** (4.119)	−16.148 *** (4.742)	−16.708 *** (4.690)
Debt	22.150 *** (3.458)	21.727 *** (3.417)	22.594 *** (3.890)	22.724 *** (3.843)
_cons	1.621 (3.384)	1.637 (3.341)	1.060 (3.915)	0.954 (3.868)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
N	415.000	415.000	331.000	331.000
F	23.239	22.524	19.374	18.666
r2	0.652	0.662	0.661	0.670

Note: The standard errors in brackets are *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

4.4.3. Propensity Score Matching (PSM) Method

In this paper, the propensity score matching (PSM) method is used to solve the endogeneity problem of missing key variables. The tendency score matching model was put forward by Rosenbaum and Rubin in 1983. According to its algorithm steps, this paper first divides the treatment group and the control group with the median value of the sample data as the boundary. Then, it obtains the tendency score through the logit regression model and carries out the PSM test by using the nearest neighbor matching method. It then obtains the results of the PSM average treatment effect and balance test [63]. The regression results in Tables 10 and 11 show that the t test after the PSM-ATT test is significant at the

level of 5%, and the bias after matching is less than 10%, and $p > 0.05$, which passes the balance test.

Table 10. PSM average processing effect.

Variable	Sample	Processing Group	Control Group	Discrepancy	Standard Error	t Test
ESG	Before matching	31.587	31.587	1.649	0.904	1.82
	After matching	31.648	29.292	2.356	1.151	2.05 **

Note: The standard errors in brackets are *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table 11. PSM balance test.

Sample	Ps R2	LRchi2	$p > \chi^2$	MeanBias	MedBias	B	R	%Var
Before matching	0.024	16.33	0.012	12.5	1.82	36.5 *	0.92	40
After matching	0.008	5.72	0.456	7.4	2.05	21.6	1.25	60

Note: The standard errors in brackets are *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

5. Discussion

Based on the testing and analysis of the above research hypotheses, except for Hypothesis H5a, all the other hypotheses are supported by the empirical analysis results, that is, media attention significantly affects the quality of the ESG information disclosure of listed companies, which is consistent with the conclusion that media attention is positively related to enterprise information disclosure put forward by Zhang Chen and others (2019), Yang Guangqing and others (2020) and Bushee and others (2010) [42–44], and it also illustrates the mutual relationship between enterprise ESG information disclosure and media attention. At the same time, it also verifies the viewpoint that the network media, policy-oriented media and market-oriented media have certain differences in their effects, which was put forward by Li Peigong, Shen Yifeng (2010) and Qi Dong (2015) [32,48]. However, different media emotional bands have different effects on the quality of the ESG information disclosure of listed companies, and negative media emotions can better promote the quality of the ESG information disclosure of listed companies, which verifies the research conclusions of Wu Xiancong and Zheng Guohong (2021), Baloria et al. (2018) and Zhao Li and Zhang Ling (2020) [34,36,37]. In addition, the shareholder relationship network can effectively adjust the influence of media attention on the quality of the ESG information disclosure of enterprises through close centrality, and the adjustment function occurs more through the information advantage of a “weak relationship”, which further illustrates the externality of the media attention governance effect.

According to the empirical research results (Table 4), media attention is positively related to the quality of the ESG information disclosure of enterprises, that is, the higher the media coverage and attention, the stronger the willingness of listed companies to disclose ESG information and the better the quality of the ESG information disclosure of enterprises. Thus, the research Hypothesis H1 is confirmed. The supervision mechanism, market pressure mechanism and reputation mechanism formed by media attention urge enterprises to disclose higher-quality ESG information in order to improve the level of social responsibility, environmental governance and internal governance, which confirms the supervision and governance effect of media proposed by Zhou Kaiguo and others (2016) [33] and the market pressure transmission mechanism of media attention proposed by Ying Qianwei and others (2017) [38], which is consistent with the conclusion that media reports increase the reputation cost of enterprises (2018). In addition, online media reports, policy-oriented media reports and market-oriented media reports are all significantly related to the quality of ESG information disclosure, and so research Hypothesis H2 is confirmed. The regression results also show that different media types have different influencing effects, where the influence coefficient of online media is larger and the influence coefficient of policy-oriented media reports and market-oriented media is relatively close

and relatively small. The possible reason is that under the special market mechanism of our country, the external governance function and governance mechanism of news media are not mature enough, the mechanism of media supervision by public opinion relying solely on the market is limited, and the guiding force of policy-oriented media is not strong, which leads to the small influence coefficient of the two. These conclusions are consistent with those of Li Peigong, Shen Yifeng (2010) and Qi Dong (2015) [32,48], although different scholars draw different conclusions about the differences in the influencing effects of the three types of media. Xiao Hongjun and others (2022) [47] concluded that the policy-oriented media have greater influence than the market-oriented media, and this paper concluded that the influencing effect of online media is greater, which may be due to the differences in the choice of sample enterprises.

According to the empirical research results (Table 5), within a given significance level, negative emotional media reports, positive emotional media reports and neutral emotional media reports have significant effects on the quality of ESG information disclosure, and therefore research Hypothesis H3 is confirmed. On the one hand, it may be because negative media reports reflect the dissatisfaction of investors and the public, which makes enterprises face great social pressure. Under heavy pressure, they can often respond to social concerns and pay attention to the concerns of stakeholders and the media more quickly and efficiently, so as to better fulfill the responsibility of ESG information disclosure and save the good image and reputation of enterprises. This conclusion is similar to that proposed by Wu Xiancong and Zheng Guohong (2021) [34]—namely, that negative media reports can reduce the illegal reduction of major shareholders. Secondly, positive emotional media reports can bring good social reputation to enterprises, and enterprises can have more resources to undertake more social responsibilities and carry out ESG management, which is consistent with the research conclusions of Baloria et al. (2018) and Zhao Li and Zhang Ling (2020) [36,37]. In addition, most scholars believe that negative emotional media reports have a greater impact, although the regression results of this paper show that positive emotional media reports have a greater impact and a higher level of significance than negative emotional media reports. There is no unified conclusion about the difference between the two, which is mainly related to the selected sample enterprises and the internal governance level of enterprises.

According to the empirical research results (Tables 6 and 7), the shareholder relationship network has a significant regulatory effect on the media attention and the quality of ESG information disclosure, and so research Hypothesis H4 is confirmed. The regulatory function of the shareholder relationship network is reflected by the degree of closeness, which shows that the closeness of the shareholder relationship between enterprises is the main reason for the regulatory function of the shareholder relationship network, which may be due to the closer the relationship between shareholders, the faster and more reliable the information obtained by enterprises and the more flexible the response and action of enterprises. Further analysis shows that the adjustment function of the shareholder social network occurs more through the information advantage of a “weak relationship”, and the connection of the shareholder relationship network can bring more information to enterprises, thus promoting the influence of media attention on the quality of the ESG information disclosure of enterprises. Thus, research Hypothesis H5a is confirmed. The conclusion of this study demonstrates the viewpoint that the shareholder relationship network proposed by Huang Can and Jiang Qingshan (2021), Song Can and Hou Xinyu (2021) and Luo Dongliang (2022) [53–55] can affect the performance and innovation of enterprises. At the same time, the research conclusion shows that the “information advantage” brought by shareholders’ social network is dominant in the analysis framework of the governance effect of media attention, which matches the externality of media attention governance, that is, the transmission and reception of external media information is still crucial in the process of media attention affecting the quality of the ESG information disclosure of enterprises.

6. Conclusions and Future Implications

6.1. Main Conclusions

Taking the companies listed on the Shanghai and Shenzhen 300 Index from 2015 to 2020 as research samples, this paper discusses the relationship between media attention and the ESG information disclosure quality of listed companies from the perspective of external governance, and it further analyzes the moderating effect of the shareholder relationship network on the relationship between media attention and the ESG information disclosure quality of enterprises. This paper draws the following conclusions: First, there is a significant positive correlation between media attention and the quality of enterprises' ESG information disclosure, that is, high-frequency media attention can promote the quality of enterprises' ESG information disclosure. Enterprises that are viewed with high concern by the media are vulnerable to the pressure of online public opinion and the supervision of administrative departments, and the illegal activities of enterprises will bring negative media reports to them, thus damaging the image and reputation of enterprises. In order to restore and maintain its reputation and enhance its sustainable development ability, an enterprise will actively improve the quality of ESG information disclosure in order to seek the trust of stakeholders, potential investors and the public. Second, in terms of the media attention types, online media reports, policy-oriented media reports and market-oriented media reports can all promote the quality of ESG information disclosure, and the effect of online media reports is more significant. In terms of media attention to emotions, negative emotional media reports can promote the quality of ESG information disclosure, positive emotions can also bring good social reputation to enterprises, and enterprises can have more resources to undertake more social responsibilities. Third, shareholders' relationship network will promote the influence of media attention on the quality of ESG information disclosure, and its regulatory role is mainly due to the information advantage of a "weak relationship". The top ten shareholders of an enterprise have complex social relationships, and the composition of the shareholder relationship network is complex and contains powerful resources and information. The closer the shareholder relationship network is, the greater the information advantage the enterprise has, and negative media reports about the enterprise can be predicted and prevented in advance, and measures to actively respond to public concerns and maintain the reputation of the enterprise and release good news will be taken to improve the quality of ESG information disclosure.

6.2. Management Implications

Based on the above conclusions First, on the ESG governance level of listed companies, enterprises should strengthen their awareness of sustainable development, actively undertake and fulfill their social responsibilities, actively build an ESG information disclosure system, and at the same time, strengthen their public opinion management capabilities. Initially, enterprise managers should attach importance to ESG and integrate the ESG concept into the company culture; subsequently, it is necessary for enterprises to incorporate ESG factors into their strategic decision-making and rationally use ESG to bring new amounts, new business and new investment to enterprises. At the same time, we should attach importance to the supervisory role of media attention, actively fulfill ESG responsibilities, and improve the quality of ESG information disclosure. Second, the media should be fully aware of the influence of media attention on the quality of enterprises' ESG information disclosure, actively fulfill the role of social supervision and external governance, enhance the universality, authenticity and professionalism of media reports, and increase the frequency of reporting on enterprises' ESG information disclosure. For enterprises with good ESG information disclosure quality, we should actively praise their contributions in terms of environment, society and governance to promote the overall ESG information disclosure quality of listed companies. For enterprises with poor ESG information disclosure quality, the media should report objectively and fairly, grasp the media emotions, ensure the warning of media reports, and ensure the efficient implementation of media external governance and supervision capabilities. Third, listed companies and related institutions should pay

attention to the information resources of the shareholder relationship network, give full play to the advantages of the social network, and attach importance to the maintenance of the major shareholder relationship. For listed companies, the relationship network composed of major shareholders can effectively promote the quality of ESG information disclosure through information advantages. Listed companies should be good at using the relationship network of shareholders to attract the investment of high-quality shareholders with high-quality resources and information, so as to achieve good ESG performance. For the government, it is necessary to make rational use of capital market rules and promote enterprises to make better use of social networks to improve the quality of ESG information disclosure through the guidance of policies and laws and regulations, so as to realize the high-quality development of enterprises.

6.3. Research Deficiencies and Prospects

Based on the research by relevant scholars, this paper discusses the influence of media attention on the quality of the ESG information disclosure of listed companies and the moderating effect of the shareholder relationship network. However, due to the difficulty of data acquisition and other reasons, there are still some limitations to this paper. For example, the indicators of the ESG information disclosure quality have institutional characteristics and preferences, which cannot cover all the factors that investors pay attention to. Emotional analysis of media attention cannot reflect the short-term and long-term impact of media reports on the public and enterprises. At the same time, it is necessary to consider the quality of media attention, as fans with low loyalty will reduce media influence (Zhou Liying, 2023) [64]. An HY et al. (2023) has found that the size of non-governmental organizations can affect their governance effectiveness [65]. Therefore, it is also necessary to consider the differences in the size of media organizations. The next research directions: (1) Compare and classify the rating data of domestic and foreign institutions to improve the depth and breadth of ESG information disclosure quality measurement standards; and (2) further enrich the empirical research by combining heterogeneity factors such as the industry, company characteristics and strength of the top ten shareholders of listed companies.

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