The Paradox of ESG Performance and Audit Fees in the Energy Sector: Mediating and Moderating Effects of Green Innovation, Supply Chain Management, and Media Attention

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Abstract: The ESG concept, which covers the dimensions of corporate environment, society, and corporate governance, has promoted the transformation of corporate goals from pursuing maximum self-interest to balancing environmental, social, and corporate governance values. The vast majority of current research focuses on how improving corporate ESG performance can reduce audit fees, and there is little literature specifically studying the relationship between ESG performance and audit fees for energy industry companies. This article takes energy-listed companies from 2018 to 2022 as samples to analyze the impact of ESG performance and its environmental, social, and corporate governance dimensions on audit fees in the energy industry. At the same time, this study explores whether ESG performance and its environmental, social, and corporate governance dimensions have an intermediary mechanism for audit fees through green innovation capabilities, supply chain integration management, and shareholder equity, as well as the moderating effect of media attention on the relationship between ESG performance, environmental, social, and corporate dimensions and audit fees. Research has found that: (1) the improvement of ESG performance, environmental performance, social performance, and corporate governance performance of energy companies cannot reduce audit fees; (2) Green innovation capability and supply chain integrated management play an intermediary role between corporate ESG performance and audit fees, supply chain integrated management and shareholder equity play an intermediary role between corporate environmental performance and audit fees, green innovation capability and supply chain integrated management play an intermediary role between corporate social performance and audit fees, and green innovation capability plays an intermediary role between corporate governance performance and audit fees; (3) Media attention has played a positive moderating role in the impact of corporate ESG performance and environmental dimensions on audit fees. The research has improved the ESG performance of energy industry enterprises in specific industries and the relationship between their performance in the environmental, social, and governance dimensions and audit fees. This will further promote energy enterprises to practice ESG concepts and achieve sustainable development.

Keywords: ESG performance, audit fees, energy-listed companies.

1. INTRODUCTION

In recent years, to deeply implement the new development concept and promote high-quality economic and social development, the government has issued a series of policy documents related to ESG to guide enterprises to practice the concept of sustainable development and standardize the disclosure of information related to sustainable development (Zhang and Ma, 2022). In February 2024, the three major stock exchanges in Shanghai, Shenzhen, and North China simultaneously released ESG disclosure guidelines, which means that ESG will truly usher in the era of mandatory disclosure. The ESG evaluation system is a systematic framework for measuring a company's performance in environmental, social, and governance aspects. It provides a comprehensive and systematic quantitative evaluation tool for companies, helping to promote their sustainable development and fulfill their social responsibilities (Sun, 2023). Energy listed companies involve energy industries such as mining, electricity, heat, gas, and water production and supply. As a key focus of the "dual carbon" strategy, authentic and transparent ESG information disclosure is an empowering tool for their business, which helps them improve their internal governance and external environment (Chai *et al*., 2024). Therefore, practicing the ESG concept is undoubtedly of great significance for promoting national strategies and achieving sustainable development.

The financial and non-financial behavior and performance of enterprises in the capital market can send certain signals to investors, thereby influencing their decision-making (Li *et al*., 2022). As a non-financial aspect of information, corporate ESG performance conveys signals to the market about the company's development and management capabilities. As a type of financial information, audit reports are issued by specialized institutions and personnel authorized or commissioned by the state to review and supervise the authenticity, correctness, compliance, legality, and effectiveness of the audited entity's finances, financial revenues and expenditures,

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E-ISSN: 2818-3401/25

business management activities, and related information (Song *et al*., 2024). The financial and non-financial information of a company complement each other and influence each other. At the same time, the company's ESG performance and audit reports can provide information support for investor decision-making. Energy security is closely related to the lifeline of the country. Against the backdrop of promoting green and low-carbon development worldwide, as a fundamental industry of the national economy, the energy industry is facing enormous transformation pressure. Achieving carbon peak and carbon neutrality goals has become the main battlefield of the energy industry (Yin *et al*., 2024). Compared to other industries, the energy industry has extremely strong political, public welfare, risk, and engineering attributes. The current literature on the relationship between corporate ESG performance and audit fees mainly focuses on overall listed companies (Jia and Xia, 2024). The conclusion drawn from the research is that the improvement of corporate ESG performance can reduce audit fees (Ren *et al*., 2023). Although some studies have noticed deficiencies in ESG information disclosure of listed companies in China, such as the fact that the majority of ESG disclosure standards implemented in China draw on mainstream international ESG information disclosure standards, the lack of ESG key technical standards has led to insufficient applicability of international standards, and the national standards that directly regulate and guide ESG work of specific industry enterprises are still waiting to be improved (Ding *et al*., 2023). Therefore, China's ESG evaluation index system is not yet comprehensive and in-depth enough. In addition, listed companies place greater emphasis on disclosing information about their advantages in their respective fields, with a tendency to focus on fully disclosing one dimension and selectively disclosing other dimensions, resulting in difficulties in evaluating the authenticity, completeness, and timeliness of information disclosure (Zhao, 2023). However, there are currently few literatures that delve into the relationship between corporate ESG performance and audit fees in specific industry sectors such as the energy industry, and the problems in evaluating corporate ESG performance have not been given sufficient attention. Overall, most of the literature on the relationship between ESG performance and audit fees of listed companies includes listed companies from various industries when selecting samples, and all have concluded that "improving ESG performance can reduce audit fees". However, there is no separate study on listed companies in the energy industry, which is a special industry. Currently, multiple ESG disclosure standards developed and released domestically are universal standards applicable to all enterprises (Lou, 2023). For a long time, there has been no ESG disclosure standard tailored to the characteristics of the energy industry. Therefore, for listed companies in the energy industry, will the improvement of corporate ESG performance lead to a reduction in audit fees, as most literature has concluded?

Therefore, this article takes the relevant data of energy-listed companies from 2018 to 2022 as research samples to explore the impact mechanism of ESG performance, environmental performance, social performance, and corporate governance performance on audit fees, as well as the mediating role of green innovation capability, supply chain integration management, and shareholder equity between them. It also tests the moderating effect of media attention on the relationship between corporate ESG performance, environmental performance, social performance, corporate governance performance, and audit fees.

The remaining research content of this article is as follows. Section 2 uses theory to preliminarily analyze the relationship between corporate ESG performance and audit fees, the mediating role of green innovation capability, supply chain integration management, and shareholder equity, as well as the moderating role of media attention. Section 3 explains the selection of samples, sources of data, and the selection and measurement of variables. Section 4 elaborates on the empirical results in detail. Section 5 compares the empirical results with hypotheses to indicate the differences and discusses the reasons for the differences between the two. Finally, the last part proposes theoretical and practical implications, research shortcomings, and prospects for the research results.

2. THEORETICAL ANALYSIS AND RESEARCH HYPOTHESIS

2.1. Analysis of the Relationship between ESG Performance and Audit Fees

At present, more than 100 standards related to ESG disclosure have been formulated and implemented in China, but the universal ESG disclosure standards applicable to all enterprises are difficult to meet the requirements of various industries. Energy companies should disclose all information that has a significant impact on the value judgments and decisions made by

stakeholders. The information content should be complete and comprehensive, and there should be no major omissions (Xu and Yao, 2024). On the one hand, currently, energy companies can only use ESG disclosure standards applicable to all companies to evaluate ESG performance, so the characteristics and evaluation standards of some energy industries themselves are not reflected in ESG evaluation indicators. On the other hand, the workload of auditors is an important factor in measuring audit fees. During the audit process, the risks faced by auditors mainly include audit risks and operational risks (Huang and Xu, 2024). Among them, the operational risks faced by auditors are closely related to the operational risks of enterprises. However, the ESG performance obtained based on ESG disclosure standards applicable to all enterprises is not comprehensive enough to reflect the true situation of energy companies. Auditors cannot make judgments on the low operational risk of the audited entity solely based on good ESG performance. They still need to measure its special aspects according to the characteristics of the energy industry. It can be seen that for energy companies, the workload of auditors has not decreased due to good ESG performance.

Meanwhile, previous studies have shown that ESG reports from companies in different industries have varying degrees of disclosure in terms of environmental, social, and corporate governance dimensions. Energy companies focus on prioritizing the declaration of environmental protection, including contributions to the construction of the company's environmental management system, low emission management, and green product manufacturing. They place greater emphasis on disclosing the environmental dimension, while selectively disclosing only the social and corporate governance dimensions, resulting in insufficient information disclosure and the need to verify its timeliness (Wang, 2024). On the other hand, energy companies all hope to expand their social reputation capital, so it remains to be debated whether companies include beautification elements in their disclosure of environmental information. Therefore, if auditors need to have a comprehensive understanding of the environment in which the audited entity operates, they need to increase their assurance efforts.

Specifically, regarding the environmental dimension, the ESG disclosure guidelines for enterprises only focus on the energy consumption of the enterprise. For energy enterprises, in addition to energy consumption, energy utilization efficiency and the utilization rate of renewable energy are also key indicators for measuring the economic and social benefits of energy enterprises (Yin *et al*., 2025). Improving energy efficiency and increasing the utilization of renewable energy not only helps companies reduce costs and enhance competitiveness but also promotes sustainable development and addresses the challenges of global climate change. Effective transportation management can ensure the efficient operation of the supply chain, reduce operating costs, and enhance the overall competitiveness of enterprises in terms of the social dimension (Yang *et al*., 2024). At the same time, based on the characteristics of energy transportation in the energy industry, safety and efficiency are equally emphasized. Through comprehensive risk identification, assessment, and response through risk management, enterprises can improve their ability to resist risks. However, the ESG disclosure guidelines for enterprises do not pay attention to evaluation indicators in transportation management. Regarding the governance dimension, which involves the internal governance structure of the company, the vast majority of true stakeholder information will not be disclosed. Therefore, there is usually an insufficient disclosure of information in this dimension (Zhang *et al*., 2024). From the above three aspects, it can be seen that the ESG performance obtained by energy companies based on the ESG disclosure guidelines may not reflect the true internal situation of the company truthfully and incompletely. Therefore, the workload of auditors may not only not decrease, but also increase. In summary, hypotheses 1, 2, 3, and 4 are proposed.

H1: The improvement of corporate ESG performance does not reduce audit fees.

H2: The improvement of corporate environmental performance does not reduce audit fees.

H3: The improvement of corporate social performance does not reduce audit fees.

H4: The improvement of corporate governance performance does not reduce audit fees.

2.2. Analysis of the Mediating Effect between the Performance of Green Innovation Capability, Supply Chain Integration Management, Shareholder Equity in the Dimension of Corporate Environment and Audit Fees

Firstly, let's analyze the impact of corporate environmental dimensions on green innovation capability as a mediating variable, as well as the

influence of green innovation capability on audit fees. From the perspective of the relationship between the environmental performance of enterprises and their green innovation capabilities, on the one hand, high-grouping enterprises in the environmental dimension are more effective in environmental management, which can reduce production costs and environmental pollution control costs, improve sustainable development performance, and make enterprises more economically motivated and feasible in green innovation (Liu *et al*., 2024). On the other hand, industrial agglomeration can stimulate the enthusiasm of enterprises for green innovation, and enterprises with better environmental performance are more likely to absorb and spread energy-saving and environmental protection concepts and green technologies in the agglomeration area (Lang *et al*., 2024). Due to their high level of concern for the environment, these enterprises pay more attention to green orientation in the flow of knowledge, information, and talent, which helps to improve their level of green innovation. From the perspective of the relationship between a company's green innovation capability and audit fees, firstly, according to modern risk-oriented audit theory and information asymmetry theory, a company's green innovation activities may introduce new risk factors, such as compliance with environmental regulations and satisfaction of sustainable development standards (Wang *et al*., 2024). At the same time, under certain specific conditions, green innovation has diversity and complexity, which require auditors to conduct additional audit procedures and professional judgments to assess audit risks, thereby increasing audit workload and costs. Secondly, green innovation often involves the application of new technologies and the exploration of new markets, which may be accompanied by higher research and development risks and market uncertainty (Li and Li, 2024). Auditors need to invest more time and resources to ensure the accuracy of financial statements when evaluating these new businesses or products, and may therefore require higher audit fees to compensate for the increased risks and efforts. Again, changes in environmental regulations may also be one of the influencing factors. For example, the implementation of environmental taxes may encourage companies to strengthen green innovation, but at the same time, it may indirectly increase audit fees by increasing compliance costs for companies (Fan and Guo, 2024). In addition, the increasing public attention to environmental issues may also lead auditors to be more cautious during the audit process, thereby increasing audit fees (Ma *et al*., 2024). In summary, although the improvement of green innovation capability can to some extent reduce environmental risks and enhance the market competitiveness of enterprises, due to the influence of various factors mentioned above, auditors may face higher risks and more complex tasks in the audit process, and thus have to cover these additional costs and risks by increasing audit fees. In summary, the improvement of a company's green innovation capability will to some extent increase audit fees.

Next, let's analyze the impact of the enterprise environment dimension on supply chain integration management as an intermediary variable, as well as the impact of supply chain integration management on audit fees. From the perspective of the relationship between the performance of enterprise environmental dimensions and their supply chain integration management, on the one hand, environmental dimension scores usually require companies to make significant capital investments, which may mean that only those companies that can afford these investments can obtain higher environmental dimension scores (Liao *et al*., 2024). However, not all companies are able or willing to make such investments, especially those with limited resources or in capital-intensive industries. On the other hand, some enterprises have weak concepts in the integrated management of digital supply chains. They often only focus on their own interests and ignore the interests and cooperative relationships of upstream and downstream enterprises, resulting in difficulties in supply chain coordination, excess inventory, and high logistics costs (Cheng, 2006). This may mean that if these enterprises perform poorly in supply chain integration management but have strong capital, although they cannot effectively implement environmental management measures to ensure supply chain efficiency, they can still achieve high environmental performance (Ye *et al*., 2023). On the contrary, if a company strives to improve its supply chain integration management, but due to limited resources or capital, its environmental performance may not show a significant improvement in the environmental dimension score (Nanaba *et al*., 2024). In summary, due to factors such as the need for capital investment and the challenges of supply chain integration management, some companies can still achieve high environmental dimension scores even with poor supply chain integration management, or their environmental dimension scores do not significantly improve after the improvement of supply

chain integration management, which to some extent reflects the negative correlation between corporate environmental dimension performance and supply chain integration management. From the perspective of the relationship between supply chain integration management and audit fees in enterprises, firstly, supply chain integration management improves the efficiency and responsiveness of the entire supply chain by integrating and coordinating various links in the supply chain (Lu *et al*., 2018). This efficient supply chain management reduces potential risks, thereby reducing the resources and time that auditors need to invest in the audit process. Secondly, integrated supply chain management typically means that enterprises can provide more accurate and transparent business processes and financial information (Matarneh *et al*., 2024). This helps auditors obtain the required information and verify it faster, reducing audit workload. For example, integrated supply chain management can improve the transparency and traceability of information in various links of the supply chain through information sharing and collaborative work, thereby reducing audit risks. Again, integrated supply chain management may lead to higher customer concentration, and research has shown that the higher the customer concentration, the lower the audit fees (Han and Wang, 2024). The presence of major clients is considered beneficial for supply chain integration, conveying favorable signals to the market, and the higher the operational efficiency and corporate governance efficiency of the enterprise, the lower the audit risk faced by the enterprise. In summary, integrated supply chain management reduces the difficulty and cost of audit work by improving the efficiency of the supply chain, reducing existing risks, and providing more accurate financial information, thus showing a negative correlation with audit fees.

Finally, let's analyze the impact of the corporate environment dimension on shareholder equity as an intermediary variable, as well as the impact of shareholder equity on audit fees. From the perspective of the relationship between corporate environmental performance and shareholder equity, companies with good environmental performance have strong environmental investment comprehensiveness, larger funding needs, usually require longer return cycles, and lower initial returns (Xu *et al*., 2024). For example, environmental investment, as a special form of investment, pursues environmental and social benefits rather than direct economic profits (Zhang *et al*., 2024). Therefore, in the short term, it may affect the return on equity of shareholders, leading to poor financial performance and subsequently having a negative impact on shareholder equity. From the perspective of the relationship between shareholder equity and audit fees in enterprises, in China, due to the imperfect governance mechanism of listed companies, especially in some family-owned or pyramid-structured enterprises, the controlling shareholder often occupies a dominant position and the power is too centralized (Lei *et al*., 2024). And they lack effective checks and balances, which makes it easy for them to transfer assets and extract profits. Meanwhile, China's unique securities market environment and relatively weak legal regulatory system make it easier for controlling shareholders to engage in "tunneling" through illegal or improper means (Luo *et al*., 2023). For example, obtaining corporate funds through related party transactions, providing financing guarantees, and other means. This may lead to the infringement of the interests of some shareholders, affect market transparency and efficiency, reduce corporate governance structure and performance, and thus affect the quality of earnings and the accuracy of accounting data (Wang and Wang, 2024). When facing the tunneling behavior of controlling shareholders, auditors face higher audit risks. When auditors encounter difficulties, they can choose to charge higher fees to manage these risks.

In summary, hypotheses 5a, 5b, and 5c are proposed.

H5a: Green innovation capability plays a mediating role between corporate environmental performance and audit fees.

H5b: Supply chain integration management plays an intermediary role between the performance of the enterprise environment dimension and audit fees.

H5c: Shareholder equity plays an intermediary role between the performance of the corporate environment dimension and audit fees.

2.3. Analysis of the Mediating Effect between the Performance of Green Innovation Capability, Supply Chain Integration Management, Shareholder Equity in the Social Dimension of Enterprises and Audit Fees

Firstly, let's analyze the impact of corporate social dimensions on green innovation capability as a mediating variable, as well as the influence of green innovation capability on audit fees. From the perspective of the relationship between corporate social performance and its green innovation capability,

companies with good social performance pay more attention to production standards, product safety, and product quality. The strong green innovation capability of a company can to some extent ensure its production quality, not only significantly improve its performance, but also help it establish a good green image and cultivate unique core competitiveness (Wang *et al*., 2024). On the other hand, companies with good social performance also pay more attention to their social influence. A good reputation of a company has value added value (Shahzad *et al*., 2024). It can enhance the market competitiveness of enterprises and is crucial for their survival and long-term development. The excellent green innovation capability of enterprises and their social influence are complementary and mutually reinforcing (Liu *et al*., 2025). In summary, a good social dimension can to some extent enhance the green innovation capability of enterprises. The relationship between the green innovation capability of enterprises and audit fees has been explained in detail in the previous text, and will not be analyzed here.

Next, let's analyze the impact of enterprise social dimensions on supply chain integration management as an intermediary variable, as well as the impact of supply chain integration management on audit fees. From the perspective of the relationship between corporate social performance and its supply chain integration management, firstly, companies with good social performance can enhance their social reputation and brand value due to their good social responsibility behavior, which helps promote their sustainable development, maintain competitive advantages in the fiercely competitive market, further strengthen cooperation with suppliers, reduce production and operation risks caused by supply and demand changes, and alleviate their dependence on large customers and suppliers (Gopalakrishnan and Zhang, 2019). Secondly, some large and well-known brands with high social dimension scores have thousands of factories spread all over the world, making monitoring the sustainable practices of these factories more complex and increasing the complexity and difficulty of supply chain management (Anas *et al*., 2024). This poses greater challenges for enterprises in integrated supply chain management. Once again, an increasing number of companies are directly subject to ESG regulations, which requires them to pay more attention to compliance in their supply chain management (Azhar *et al*., 2022). Enterprises with good social performance need to make more efforts to meet compliance requirements, which increases their operating costs and management difficulties, thereby affecting the effectiveness of supply chain integration management (Tao *et al*., 2024). In summary, the reduced dependence of enterprises on the supply chain, management complexity caused by technological and information asymmetry, and compliance requirements further exacerbate the negative correlation between social dimension performance and supply chain integration management. The relationship between supply chain integration management and audit fees for enterprises has been explained in detail in the previous text, and will not be analyzed here.

Finally, let's analyze the impact of corporate social dimensions on shareholder equity as an intermediary variable, as well as the influence of shareholder equity on audit fees. From the perspective of the relationship between corporate social performance and shareholder equity, corporate social performance involves the company's performance in employee management, career development, supply chain management, product quality and safety, consumer rights protection, and social contribution. From the perspective of stakeholder theory, companies are not only responsible to shareholders, but also to other stakeholders such as employees, customers, and communities. Good social performance of enterprises requires them to actively undertake and practice social responsibility (Jan *et al*., 2024). In this process, companies often need to invest more costs, such as participating in social welfare activities and dealing with toxic substances generated in the production process. Therefore, there is a possibility of a negative impact on the company's financial performance in the short term, and shareholders may face the risk of reduced or canceled dividends, leading to a decrease in shareholder equity (Moon *et al*., 2019). The relationship between shareholder equity and audit fees in enterprises has been explained in detail in the previous text, and will not be analyzed here.

In summary, hypotheses 6a, 6b, and 6c are proposed.

H6a: Green innovation capability plays a mediating role between corporate social performance and audit fees.

H6b: Supply chain integration management plays an intermediary role between corporate social performance and audit fees.

H6c: Shareholder equity plays an intermediary role between the performance of corporate social dimensions and audit fees.

2.4. Analysis of the Mediating Effect between the Performance of Green Innovation Capability, Supply Chain Integration Management, Shareholder Equity in the Dimension of Corporate Governance and Audit Fees

Firstly, let's analyze the impact of corporate governance dimensions on green innovation capability as a mediating variable, as well as the influence of green innovation capability on audit fees. From the perspective of the relationship between corporate governance performance and its green innovation capability, companies with good governance performance pay more attention to aligning their long-term development strategies with the country's future development trends (Wang *et al*., 2023). The policy document "Implementation Plan for Further Improving the Market-oriented Green Technology Innovation System (2023-2025)" jointly issued by the National Development and Reform Commission and the Ministry of Science and Technology mentions that "we must adhere to goal orientation and problem orientation, focus on solving the problem of insufficient technological support for green and low-carbon development, take institutional and mechanism innovation as an important driving force, and enhance the main position of enterprises in green technology innovation." Therefore, the future development direction of enterprises will gradually move towards green innovation. On the other hand, companies with good governance performance also pay more attention to their governance effectiveness, including innovation and sustainable development. A sound governance mechanism for enterprises can ensure that they take action in environmental governance and social responsibility, thereby enhancing their overall green innovation capabilities (Rahman *et al*., 2024). In summary, the dimensions of good corporate governance in enterprises can to some extent enhance their green innovation capabilities. The relationship between the green innovation capability of enterprises and audit fees has been explained in detail in the previous text, and will not be analyzed here.

Next, let's analyze the impact of corporate governance dimensions on supply chain integration management as an intermediary variable, as well as the impact of supply chain integration management on audit fees. From the perspective of the relationship between corporate governance and its integrated supply chain management, a strong corporate governance structure is the key to ensuring the effective implementation of corporate commitments, recording progress, and managing delivery risks (Danilov, 2024). However, if the power of a company is too centralized and the internal control system is not sound, then those in power may carry out behaviors that violate laws, regulations, or professional ethics based on their own information advantages and excessive control power (Kroll and Edinger, 2023). These behaviors not only damage the reputation of the enterprise but also increase the complexity and risks of supply chain integration management, thereby affecting the integration and coordination of the supply chain. The relationship between supply chain integration management and audit fees for enterprises has been explained in detail in the previous text, and will not be analyzed here.

Finally, let's analyze the impact of corporate governance dimensions on shareholder equity and the influence of shareholder equity on audit fees when using shareholder equity as an intermediary variable. From the perspective of the relationship between corporate governance performance and shareholder equity, companies with good governance performance often hope to maintain their good performance to ensure their reputation and brand image, and thus maintain the stability of stock prices and investments (Gao *et al*., 2022). Faced with potential risks and issues, companies may choose not to disclose, thereby ignoring the importance of sustainable development for the enterprise (Wang, 2024). Ultimately leading to damage to shareholder interests. The relationship between shareholder equity and audit fees in enterprises has been explained in detail in the previous text, and will not be analyzed here.

In summary, hypotheses 7a, 7b, and 7c are proposed.

H7a: Green innovation capability plays a mediating role between corporate governance performance and audit fees.

H7b: Supply chain integration management plays an intermediary role between corporate governance performance and audit fees.

H7c: Shareholder equity plays an intermediary role between corporate governance performance and audit fees.

2.5. Analysis of the Moderation Effect of Media Attention

The energy industry is a key component of national infrastructure and economic development, therefore its construction and operation will receive high attention from relevant departments of the country. To demonstrate their active response to national policies, energy companies often focus on disclosing key and well-performing measurement indicators of external stakeholders, which can also expand their social reputation capital and provide favorable information for their investors and potential investors (Yin *et al*., 2024). The performance of enterprises in environmental, social, and governance dimensions is not only a legal and policy requirement for energy enterprises, but also a key factor in their social responsibility, market competitiveness, and sustainable development. By actively fulfilling their responsibilities, energy companies can occupy a favorable position in high-quality development and contribute to building a harmonious and symbiotic modern society (Xu and Zhao, 2024).

Media attention can significantly enhance a company's level of information disclosure. According to the attention theory and signal transmission theory, the larger the number of media reports, the richer the content of information disclosure of listed companies. High-quality information disclosure can enhance the transparency of enterprises, thereby improving their overall reputation and market trust, and increasing their attractiveness and competitiveness (Qiu *et al*., 2024). Secondly, the external regulatory pressure generated by media attention encourages enterprises to pay more attention to their overall development, to reduce penalties and reputation damage, improve corporate performance, and also help reduce the risk of corporate violations, enhance the overall management level and compliance of enterprises (Zheng *et al*., 2024). In summary, media attention positively regulates the performance of the corporate environment, society, and governance dimensions through multiple mechanisms. Therefore, for key indicators that energy companies should disclose but have not, auditors will broaden their perspective on the company and gain more understanding of the internal situation. Correspondingly, audit fees will also be correspondingly increased.

In summary, hypotheses 8, 9, and 10 are proposed.

H8: Media attention plays a positive moderating role in the impact of corporate environmental performance on audit fees.

H9: Media attention plays a positive moderating role in the of corporate social dimensions on audit fees.

H10: Media attention plays a positive moderating role in the impact of corporate governance on audit fees.

ESG comprehensively evaluates the sustainability of a company's operations and its impact on social values from three dimensions: environmental, social, and corporate governance. Summarizing the analysis conducted from each dimension, hypotheses 11a, 11b, 11c, and 12 are proposed.

H11a: Green innovation capability plays a mediating role between corporate ESG performance and audit fees.

H11b: Supply chain integration management plays an intermediary role between corporate ESG performance and audit fees.

H11c: Shareholder equity plays an intermediary role between corporate ESG performance and audit fees.

H12: Media attention plays a positive moderating role in the impact of corporate ESG performance on audit fees.

The theoretical impact model involved in this study is shown in Figure **1**.

3. RESEARCH DESIGN

3.1. Sample Selection and Data Sources

This article selects relevant data from energy-listed companies from 2018 to 2022 as research samples (energy-listed companies are selected according to the 2012 industry classification of the China Securities Regulatory Commission). The specific data collection and cleaning process is as follows: (1) Exclude samples with missing ESG comprehensive scores, "E", "S", and "G" subscores, audit fees, and control variable observations; (2) Exclude ST listed companies with abnormal financial or other conditions. Finally, a total of 156 listed companies' annual data were obtained. Among them, ESG-related data comes from the Huazheng ESG rating results of the WIND database, and other data such as audit fees come from the Guotai An database.

3.2. Variable Selection and Measurement

3.2.1. Definition of Audit Fees and Selection of Indicators

Audit fees (AF) are the dependent variable in this article. Referring to the research of (Ren *et al*., 2023)

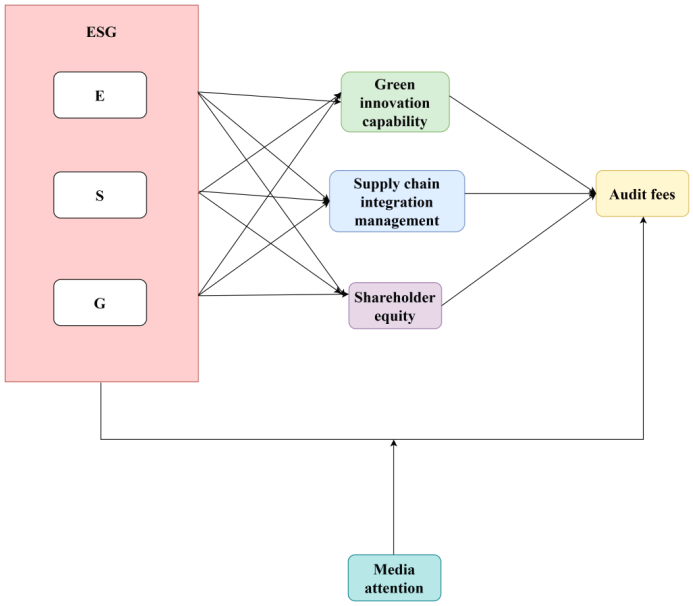

Figure 1: Theoretical model.

the audit fees from 2018 to 2022 were used for measurement.

3.2.2 Definition and Indicator Selection of Corporate ESG Performance

The performance of ESG and the sub-items of E, S, and G are the explanatory variables in this article. The "ESG" performance is measured using the comprehensive ESG score in the Huazheng ESG evaluation index, while the "E", "S", and "G" sub-items are measured using the "E score", "S score", and "G score" in the Huazheng ESG evaluation index.

3.2.3 Selection of Mediating Variables

This article selects three variables, namely "green innovation capability", "supply chain integration management", and "shareholder equity", as the mediating variables. The "green innovation capability" is measured by the number of green patents applied for by listed companies each year, the "supply chain integration management" is measured by the average of the purchase and sales ratios of the top five suppliers and customers, and the "shareholder equity" is measured by the shareholder equity ratio, which is the proportion of total capital invested by shareholders to the total assets of the enterprise.

3.2.4 Selection of Regulating Variables

This article selects the variable of "media attention" as the moderating variable and constructs a media attention index using the Janis Fadner coefficient (J-F) (Li *et al*., 2022) The J-F coefficient is an indicator used to measure the level of media attention that a company receives. It is calculated based on the difference between the number of positive and negative reports. The range of J-F coefficient values is between -1 and 1. The closer the value is to 1, the less media attention pressure the enterprise is facing, and there may be better investment opportunities. The closer the value is to -1, the greater the media attention pressure faced by the enterprise, and there may be certain operational risks that require cautious investment. In the J-F coefficient, the number of positive reports is represented by e, the number of negative reports is represented by c, and the sum of the number of positive and negative reports is represented by t.

$$J-F\ coefficient\begin{cases}\dfrac{e^2-ec}{t^2} & if\ e>c\\ \dfrac{ec-c^2}{t^2} & if\ e<c\\ 0 & if\ e=c\end{cases} \quad (1)$$

3.2.5. Selection of Control Variables

This article controls for variables that may have an impact on the relationship between the explanatory and dependent variables studied, including equity nature (En), year (Year), company listing age (Age), Tobin's Q value (Tob), board size (Bod), and industry environmental sensitivity (Sen) (Xu and Yao, 2024). The degree of digital transformation of the company (Dtr) (Ren *et al*., 2023). Regarding whether the specific industry to which energy companies belong is environmentally sensitive, according to the heavy pollution industry standards recognized in China's 2010

"Guidelines for Environmental Information Disclosure of Listed Companies", 11 industries including B07, B08, B09, C25, C26, C28, C29, C30, C31, C32, and D44 are classified as environmentally sensitive industries, while the rest of the industries are classified as non environmentally sensitive industries (Chai *et al*., 2024). The specific definitions of control variables are shown in Table **1**.

4. EMPIRICAL RESULTS AND ANALYSIS

4.1. Descriptive Statistics and Correlation Analys

The mean, standard deviation, and bivariate Pearson test results of each variable in this study are shown in Table **2**. ESG performance (r=0.42, P<0.01), environmental performance (r=0.36, P<0.01), social performance (r=0.31, P<0.01), and corporate governance performance (r=0.29, P<0.01) are all significantly positively correlated with audit fees; ESG performance is significantly positively correlated with green innovation capability (r=0.11, P<0.01), significantly negatively correlated with supply chain integrated management (r=-0.08, P<0.05), and not correlated with shareholder equity; The environmental dimension is significantly negatively correlated with supply chain integration management (r=-0.09, P<0.05) and shareholder equity (r=-0.15, P<0.01), but not with green innovation capability; There is a significant positive correlation between social dimension performance and green innovation capability (r=0.09,P<0.05), a significant negative correlation with supply chain integrated management (r=-0.12, P<0.01), and no correlation with shareholder equity; The performance of corporate governance dimensions is significantly positively correlated with green innovation capability (r=0.09, P<0.05) and shareholder equity (r=0.10, P<0.01), but not with supply chain integrated management.

4.2. Mediation Effect and Moderation Test

To explore the intrinsic mechanism of the significant positive impact of ESG, E, S, and G on audit fees, the

Table 1: Definition of Main Variables

Variable type	Variable name	Variable symbol	Variable definition
Dependent variable	Audit fees	Af	Ln (annual audit fee)
Explanatory variables	ESG performance	ESG	Huazheng ESG comprehensive score
Explanatory variables	Environmental dimension performance	E	Huazheng's score in environmental aspects
Explanatory variables	Social dimension performance	S	Huazheng's score in social responsibility
Explanatory variables	Performance of corporate governance dimensions	G	Huazheng's score in corporate governance
Intermediary variable	Green innovation capability	GI	The number of green patent applications by listed companies
Intermediary variable	Integrated supply chain management	SCM	(Purchase ratio to top 5 suppliers+sales ratio to top 5 customers)/2
Intermediary variable	Shareholders' equity	SER	Total capital invested by shareholders/total assets
Adjusting variables	Media attention	J-F	According to the measurement method mentioned earlier, it is obtained
Control variable	Nature of equity	En	Is the company "state-owned"? Yes, take a value of 1; No, take a value of 0
	Particular year	Year	Particular year
	Company listing period	Age	Number of years the company has been listed
	Tobin's Q value	Tob	Market value/total assets of the company
	Board size	Bod	Number of Board Members
	Industry environmental sensitivity	Sen	1 for environmentally sensitive enterprises, otherwise 0
	The degree of digital transformation of the company	Dtr	The total frequency of sub-indicators of artificial intelligence technology, blockchain technology, cloud computing technology, big data technology, and digital technology appearing in the report

Table 2: Definition of Main Variables

Variable	Mean value	Standard deviation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	14.33	0.78	1															
2	72.89	6.17	0.42**	1														
3	58.79	7.74	0.36**	0.56**	1													
4	75.90	10.42	0.31**	0.77**	0.31**	1												
5	78.46	7.39	0.29**	0.81**	0.31**	0.33**	1											
6	6.71	58.45	0.27**	0.11**	0.06	0.09*	0.09*	1										
7	47.85	19.34	-0.18**	-0.08*	-0.09*	-0.12**	0.01	-0.12**	1									
8	0.48	0.17	-0.17**	0.00	-0.15**	-0.04	0.10**	0.01	0.06	1								
9	0.18	0.21	0.06	0.18**	0.14**	0.09**	0.20**	0.03	-0.09*	0.07*	1							
10	0.73	0.44	0.09*	0.25**	0.12**	0.06	0.33**	0.06	0.11**	-0.16**	0.03	1						
11	2020	1.42	0.53**	0.36**	0.24**	0.22**	0.32**	-0.03	0.05	0.06	-0.00	0.02	1					
12	21.43	7.26	0.05	-0.03	0.05	-0.07*	-0.02	0.02	0.05	-0.07	-0.01	0.22**	0.07	1				
13	1.41	1.22	-0.19**	-0.18**	-0.19**	-0.17**	-0.08*	-0.04	0.14**	0.15**	-0.03	-0.14**	0.01	-0.01	1			
14	9	2.13	0.28**	0.13**	0.11**	0.09**	0.09*	0.06	-0.02	-0.22**	0.04	0.23**	0.12**	0.02	-0.15**	1		
15	0.54	0.50	0.07*	0.05	0.15**	-0.03	0.03	0.07*	0.33**	-0.01	-0.01	0.11**	0.00	0.31**	-0.01	0.05	1	
16	3.28	5.96	-0.02	0.08*	0.16**	0.07	0.03	-0.02	-0.13**	0.03	0.05	-0.24**	-0.02	-0.16**	-0.05	-0.13**	-0.12**	1

Note 1: Digital representation: 1. Audit fees 2. ESG 3. E 4. S 5. G 6. Green innovation capability 7. Supply chain integration management 8. Shareholder equity 9. Media attention 10. Equity nature 11. Year 12. Company listing period 13. Tobin's Q value 14. Board size 15. Industry environmental sensitivity 16. Company digital transformation degree. 2. N=156; *, and ** are significant at the level of 5% and 1% respectively.

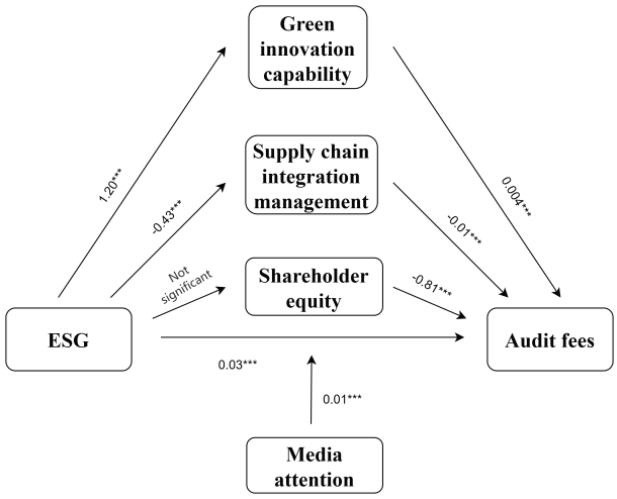

Figure 2: Path coefficient diagram of ESG, green innovation capability, supply chain integration management, shareholder equity, media attention, and audit fees.

Note: ***P<0.001, **P<0.01, *P<0.05, the same applies below.

study further introduces green innovation capability, supply chain integration management, and shareholder equity as mediating variables, and media attention as moderating variables into the structural equation model. The mediation and moderation effects were tested by using Model4 and Model1 in the SPSS macro program ProcESGs. Using the Bootstrap method provided by HayESG, verify and analyze the mediating effects of three mediating variables between ESG, E, S, G and audit fees, as well as the moderating effect of media attention variables on the impact of ESG, E, S, G on audit fees.

4.2.1 Testing the Mediating and Moderating Effects of Green Innovation Capability, Supply Chain Integration Management, Shareholder Equity, and Media Attention between ESG and Audit Fees

The path coefficients of green innovation capability, supply chain integration management, shareholder equity, and media attention between corporate ESG performance and audit fee variables are shown in Figure **2**.

From the test results in Figure **2**, it can be seen that the path coefficient from ESG to audit fees is positively significant (r=0.03, P<0.001). Therefore, H1 is further validated. In addition, ESG has a significant positive impact on green innovation capability (r=1.20, P<0.001), a significant negative impact on supply chain integration management (r=-0.43, P<0.001), and no significant impact on shareholder equity. Green innovation capability (r=0.004, P<0.001) has a significant positive impact on audit fees, while supply chain integration management (r=-0.01, P<0.001) and shareholder equity (r=-0.81, P<0.001) both have a significant negative impact on audit fees. Therefore, H11a and H11b have been preliminarily validated. However, since ESG has no significant impact on shareholder equity, only shareholder equity has a significant impact on audit fees. Only one of the two paths from ESG to shareholder equity and from shareholder equity to audit fees is smooth. Therefore, there is no mediating effect caused by shareholder equity between ESG variables and audit fee variables, and the H11c hypothesis is not valid. At the same time, media attention can positively regulate the promotion effect of corporate ESG performance on audit fees (r=0.01, P<0.001).

According to Table **3**, the upper and lower limits of the Bootstrap 95% confidence interval for the mediating effect of ESG on audit fees, green innovation capability, and supply chain integration management do not include 0, indicating that corporate ESG performance not only has a direct effect on audit fees but also has a mediating effect on audit fees through the variables of green innovation capability and supply chain integration management.

4.2.2. Testing the Mediating and Moderating Effects of Green Innovation Capability, Supply Chain Integration Management, Shareholder Equity, and Media Attention between E and Audit Fees

The path coefficients between the performance of green innovation capability, supply chain integration management, shareholder equity, and media attention in the dimension of corporate environment and audit fee variables are shown in Figure **3**.

Table 3: Decomposition of Direct and Mediating Effects of Green Innovation Capability and Supply Chain Integrated Management as Mediating Variables

Intermediary variable	Effect	Effect value	Bootstrap standard error	95% confidence interval	
				Lower limit	Upper limit
Green innovation capability	Direct effect	0.029	0.004	0.02	0.04
	Intermediary effect	0.004	0.002	0.002	0.01
Integrated supply chain management	Direct effect	0.029	0.004	0.02	0.04
	Intermediary effect	0.004	0.001	0.002	0.01

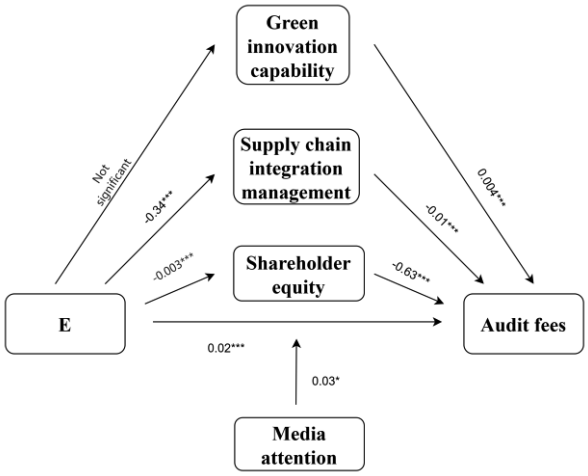

Figure 3: Path coefficient diagram of E, green innovation capability, supply chain integration management, shareholder equity, media attention, and audit fees.

From the test results in Figure **3**, it can be seen that the path coefficient from the enterprise environment dimension to audit fees is positively significant (r=0.02, P<0.001). Therefore, H2 is further validated. In addition, the negative impact of the enterprise environment dimension on supply chain integration management (r=-0.34, P<0.001) and shareholder equity (r=-0.003, P<0.001) is significant, but the impact on green innovation capability is not significant. Green innovation capability (r=0.004, P<0.001) has a significant positive impact on audit fees, while supply chain integration management (r=-0.01, P<0.001) and shareholder equity (r=-0.63, P<0.001) both have a significant negative impact on audit fees. Therefore, H5b and H5c have been preliminarily validated, but because the performance of the enterprise environment dimension has no significant impact on green innovation capability, only green innovation capability has a significant impact on audit fees. The two paths from the enterprise environment dimension to green innovation capability and from green innovation capability to audit fees are only smooth, so there is no mediating effect caused by the variable of green innovation capability between the performance variable of the enterprise environment dimension and the audit fee variable, that is, the H5a hypothesis is not valid. At the same time, media attention can positively regulate the promotion effect of corporate environmental performance on audit fees (r=0.03, P<0.05).

According to Table **4**, the bootstrap 95% confidence interval for the mediating effect of the enterprise environment dimension on audit fees, supply chain integration management, and shareholder equity does not include 0, indicating that the enterprise environment dimension not only has a direct effect on audit fees but also has a mediating effect on audit fees through the variables of supply chain integration management and shareholder equity.

4.2.3. Testing the Mediating and Moderating Effects of Green Innovation Capability, Supply Chain Integration Management, Shareholder Equity, and Audit Fees between S and Audit Fees

The path coefficients between the performance of green innovation capability, supply chain integration

Table 4: Decomposition of Direct and Mediating Effects of Supply Chain Integrated Management and Shareholder Equity as Mediating Variables

Intermediary variable	Effect	Effect value	Bootstrap standard error	95% confidence interval	
				Lower limit	Upper limit
Integrated supply chain management	Direct effect	0.022	0.004	0.01	0.03
	Intermediary effect	0.003	0.001	0.002	0.01
Shareholders' equity	Direct effect	0.023	0.004	0.02	0.03
	Intermediary effect	0.002	0.001	0.001	0.003

management, shareholder equity, and media attention in the corporate social dimension and audit fee variables are shown in Figure **4**.

From the test results in Figure **4,** it can be seen that the path coefficient from the corporate social dimension to audit fees is positively significant (r=0.01, P<0.001). Therefore, H3 is further validated. In addition, the positive and significant impact of the corporate social dimension on green innovation capability (r=0.52, P<0.05), the negative and significant impact on supply chain integration management (r=-0.19, P<0.01), and the impact on shareholder equity are not significant. Green innovation capability (r=0.004, P<0.001) has a significant positive impact on audit fees, while supply chain integration management (r=-0.01, P<0.001) and shareholder equity (r=-0.74, P<0.001) both have a significant negative impact on audit fees. Therefore, H6a and H6b have been preliminarily validated. However, since the performance of the corporate social dimension does not have a significant impact on shareholder equity, only shareholder equity has a significant impact on audit fees. The corporate social dimension shows that there is only one smooth path between shareholder equity and the two paths from shareholder equity to audit fees. Therefore, there is no mediating effect caused by shareholder equity between the performance variables of the corporate social dimension and the audit fee variable, and the H6c hypothesis is not valid. In addition, the moderating effect of media attention on the relationship between the social dimension performance of enterprises and audit fees is not significant.

According to Table **5**, the bootstrap 95% confidence interval for the mediating effect of corporate socialdimension performance on audit fees, green innovation capability, and supply chain integration management does not include 0, indicating that corporate social dimension performance not only has a direct effect on audit fees but also has a mediating effect on audit fees through the variables of green innovation capability and supply chain integration management.

4.2.4. Testing the Mediating and Moderating Effects of Green Innovation Capability, Supply Chain Integration Management, Shareholder Equity, and Media Attention between G and Audit Fees

The path coefficients between the performance of green innovation capability, supply chain integration management, shareholder equity, and media attention

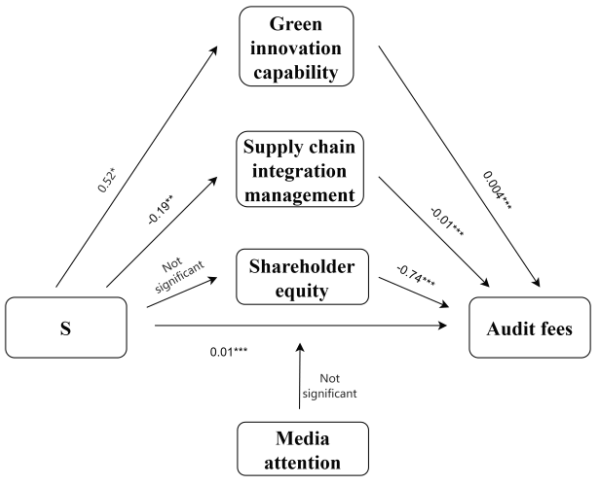

Figure 4: Path coefficient diagram of S, green innovation capability, supply chain integration management, shareholder equity, media attention, and audit fees.

Table 5: Decomposition Table of Total Effect, Direct Effect, and Intermediary Effect When Green Innovation Capability and Supply Chain Integrated Management are Mediated Variables

Intermediary variable	Effect	Effect value	Bootstrap standard error	95% confidence interval	
				Lower limit	Upper limit
Green innovation capability	Direct effect	0.013	0.002	0.01	0.02
	Intermediary effect	0.002	0.001	0.001	0.004
Integrated supply chain management	Direct effect	0.013	0.003	0.01	0.02
	Intermediary effect	0.002	0.001	0.001	0.004

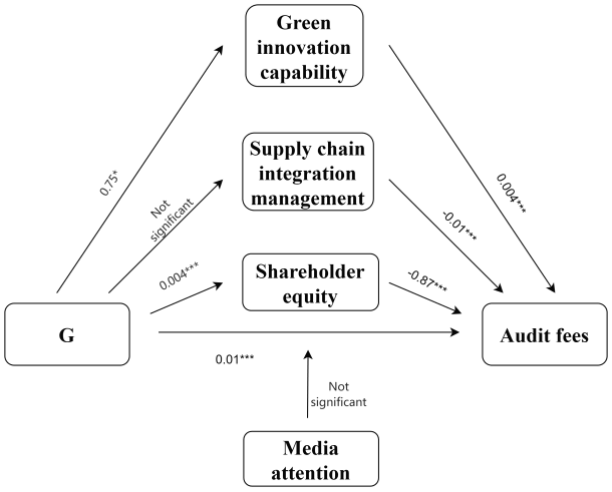

Figure 5: Path coefficient diagram of G, green innovation capability, supply chain integration management, shareholder equity, media attention, and audit fees.

in the dimensions of corporate governance and audit fee variables are shown in Figure **5**.

From the test results in Figure **5**, it can be seen that the path coefficient from the corporate governance dimension to audit fees is positively significant (r=0.01, P<0.001). Therefore, H4 is further validated. In addition, the dimension of corporate governance has a significant positive impact on green innovation capability (r=0.75, P<0.05) and shareholder equity (r=0.004, P<0.01), but has no significant impact on supply chain integration management. Green innovation capability (r=0.004, P<0.001) has a significant positive impact on audit fees, while supply chain integration management (r=-0.01, P<0.001) and shareholder equity (r=-0.87, P<0.001) both have a significant negative impact on audit fees. Therefore, H7a has been preliminarily validated, but because the performance of corporate governance dimensions has no significant impact on supply chain integration management, only supply chain integration management has a significant impact on audit fees. The performance of corporate governance dimensions shows that there is only one smooth path between supply chain integration management and audit fees. Therefore, there is no mediating effect caused by the variable of supply chain integration management between the performance variables of corporate governance dimensions and audit fees, and the hypothesis of H7b is not valid. At the same time, the dimension of corporate governance has a significant positive impact on shareholder equity, while shareholder equity has a significant negative impact on audit fees. That is to say, the indirect effect of the dimension of corporate governance on audit fees through shareholder equity is negative, while the direct effect of the dimension of corporate governance on audit fees is positive, and the indirect effect has a masking effect on the direct effect. Therefore, the H7c hypothesis is not valid. In addition, the moderating effect of media attention on the relationship between corporate governance dimensions and audit fees is not significant.

According to Table **6**, the bootstrap 95% confidence interval for the mediating effect of corporate governance dimensions on audit fees, green innovation capability, and shareholder equity does not include 0,

Table 6: Decomposition Table of Total Effect, Direct Effect, and Mediating Effect when Green Innovation Capability and Shareholder Equity are Mediated Variables

Intermediary variable	Effect	Effect value	Bootstrap standard error	95% confidence interval	
				Lower limit	Upper limit
Green innovation capability	Direct effect	0.011	0.004	0.004	0.02
	Intermediary effect	0.003	0.001	0.001	0.01
Shareholders' equity	Direct effect	0.017	0.004	0.01	0.03
	Intermediary effect	-0.003	0.001	-0.01	-0.001

indicating that corporate governance dimensions not only have a direct effect on audit fees but also have a mediating effect on audit fees through the variables of green innovation capability and shareholder equity.

5. DISCUSSION

5.1. Comparative Analysis of Intermediary Effect Hypothesis and Empirical Results

The hypothesis of the mediation effect is compared with the empirical results. Hypotheses H5a, H6c, H7b, H7c, and H11c are inconsistent with the empirical results, while the other hypotheses of the mediation effect are consistent with the empirical results.

The reason for the inconsistency between H5a and empirical results is that the environmental dimension has no significant impact on the green innovation capability of enterprises.

Some studies have shown that environmental variables have a significant promoting effect on green technology innovation, while others suggest that companies with high scores in the environmental dimension may exhibit lower levels of innovation due to industry characteristics. On the one hand, energy companies often perform poorly in terms of specific energy industry risks and effective contributions to sustainable development goals. The main focus of its corresponding indicators is product lifecycle assessment, material utilization rate, etc. This widespread poor performance is related to the significant turbulence faced by the industry, so energy companies are more focused on addressing environmental risks rather than promoting innovation (Justyna *et al*., 2021). On the other hand, many energy companies focus on similar sustainability and governance activities, lacking strategic differentiation, which may lead to their innovation efforts being overlooked as they tend to follow universal sustainability standards rather than seeking unique methods that can bring competitive advantages. Meanwhile, other factors such as digital transformation, market competition intensity, and institutional environment play a positive moderating role between the environmental performance of energy enterprises and green innovation (Zhu *et al*., 2024). This means that these external factors may mask the direct impact of environmental dimensions on green innovation, further weakening the correlation between the two. In summary, due to different external regulatory factors, the correlation between the environmental dimension of ESG and green innovation capability is not significant. Therefore, there is no mediating effect caused by the variable of green innovation capability between the E variable and the audit fee variable.

The reason for the inconsistency between H6c and empirical results is that the social dimension does not have a significant impact on shareholder equity. From a theoretical perspective, the shareholder value theory in modern enterprise theory holds that the main goal of a company is to maximize shareholder wealth, rather than succumbing to social factors at the expense of shareholder interests. Friedman and other economists believe that corporate social responsibility is limited to using its resources to engage in activities aimed at increasing its profits within the scope permitted by laws and regulations, thereby expanding the reputation capital of the enterprise (Khaled *et al*., 2024). Therefore, from the perspective of shareholder value theory, the impact of social dimensions on shareholder equity is not significant. From the perspective of corporate governance, factors such as the protection of shareholder rights and interests are important indicators for measuring the level of corporate governance. The current ESG disclosure guidelines for enterprises mainly include disclosure indicators related to employee rights, product responsibility, supply chain management, and social response in the social dimension. The performance of shareholder equity is not directly related to the social dimension, therefore the impact of the social dimension of energy enterprises on shareholder equity is not significant.

The reason for the inconsistency between H7b and empirical results is that the performance of corporate

governance dimensions does not have a significant impact on the supply chain integration management of enterprises. The governance dimensions include corporate governance structure, governance mechanism, and governance effectiveness, including information disclosure, risk management, etc. These contents mainly focus on internal management and operation of enterprises, while supply chain integration management involves collaboration and integration between enterprises and external suppliers and partners. It is necessary to consider how to achieve overall optimization of the supply chain through effective communication and coordination mechanisms, and pay more attention to collaboration and integration between enterprises and external suppliers and partners (Chen, 2024). Although the influencing factors involved in the governance dimension have a significant impact on the overall operation of the enterprise, they do not directly affect the supply chain integration management of the enterprise. Therefore, there is no significant correlation between the performance of the corporate governance dimension and its supply chain integration management.

The reason for the inconsistency between H7c and empirical results is that the indirect effect of the corporate governance dimension on audit fees through shareholder equity is negative, while the direct effect of the corporate governance dimension on audit fees is positive, and the indirect effect has a masking effect on the direct effect. From the previous analysis, it can be seen that the dimension of corporate governance has a positive and significant impact on shareholder equity, while there is a negative correlation between shareholder equity and audit fees. Therefore, the indirect effect of the dimension of corporate governance on audit fees through shareholder equity is negative, opposite to the direction of the direct effect.

The reason for the inconsistency between H11c and empirical results is that ESG performance does not have a significant impact on shareholder equity. Improving ESG performance requires resource investment, which often fails to generate significant financial returns in the short term (Zhang and Yang, 2024). If management overinvests in ESG-related activities, it may consume the limited resources of the company, leading to a decline in corporate value and economic profits, and thus threatening shareholder interests. Therefore, for some companies and investors, the benefits brought by the improvement of ESG performance are easily mistaken as a “blank check” in the short term.

5.2. Comparative Analysis of Moderation Effect Hypothesis and Empirical Results

Comparing the moderation effect hypothesis with the empirical results, hypotheses H9 and H10 are inconsistent with the empirical results, while the other moderation effect hypotheses are consistent with the empirical results.

On the one hand, the social and governance dimensions of enterprises involve sensitive internal topics such as the company’s risk management capabilities, supervisory board governance, and substantive social responsibility. Their transparency, information disclosure level, and credibility urgently need to be improved. On the other hand, due to the lack of excessive disclosure of true information within the company, the transmission mechanism of media attention on audit quality is generally operational, and auditors cannot fully understand the decisive indicators for judging the real environment of the audited unit. Therefore, the media’s attention to listed companies cannot attract enough attention and attention from auditors, resulting in limited effectiveness of media attention. Therefore, the moderating effect of media attention on the relationship between the social and corporate governance dimensions of enterprises and audit fees is not significant.

6. CONCLUSION AND FUTURE PROSPECTS

6.1. Conclusion

This article selects energy-listed companies from 2018 to 2022 as research samples, and uses empirical analysis to study the ESG performance of enterprises in the specific energy industry, as well as the relationship between environmental, social, and governance dimensions and audit fees. At the same time, it explores the relationship between enterprises' green innovation capabilities, supply chain integration management, and shareholder equity in the independent and dependent variables, and draws the following conclusions:

For energy companies, ESG performance, environmental performance, social performance, and corporate governance performance are all significantly positively correlated with audit fees. On the one hand, the general corporate ESG disclosure guidelines are difficult to meet the requirements of various industries, and the key evaluation indicators determined based on the industry characteristics of the energy industry are not taken into account, resulting in incomplete and

comprehensive ESG evaluation results. On the other hand, energy companies focus on disclosing information in the environmental dimension, while selectively disclosing information in the social and governance dimensions. Therefore, the comprehensiveness, authenticity, and timeliness of the disclosed information need to be verified. Overall, auditors need to invest more effort in verifying the information provided by the company.

Green innovation capability and supply chain integrated management play an intermediary role between corporate ESG performance and audit fees, supply chain integrated management and shareholder equity play an intermediary role between corporate environmental performance and audit fees, green innovation capability and supply chain integrated management play an intermediary role between corporate social performance and audit fees, and green innovation capability plays an intermediary role between corporate governance performance and audit fees.

The media focuses on the positive regulation of corporate ESG performance and the impact of corporate environmental dimensions on audit fees. The external regulatory pressure generated by media attention encourages enterprises to actively respond to regulatory requirements and policy guidance for environmental protection, and improve the overall management level of enterprises, and auditors will also have a better understanding of key indicators that enterprises should disclose but have not.

6.2. Implications

6.2.1. Theoretical Implications

The ESG performance of enterprises in the three dimensions of environment, society, and corporate governance promotes the enhancement of their green innovation capabilities by improving their social influence and governance efficiency. However, innovation and risk coexist. While applying new technologies and exploring new markets, it is necessary to be fully prepared to deal with technological risks and market turbulence in the research and development process. In addition, while ensuring good ESG performance, enterprises should not only focus on their interests but also attach importance to cooperation with other enterprises to ensure the efficiency of the supply chain. At the same time, they should also pay attention to issues such as supervision and cost control. Finally, the improvement of ESG performance takes time, and it is important to avoid blindly pursuing superficial results and engaging in illegal operations, neglecting the sustainable development of the enterprise. Investing in ESG may bring some negative impacts to the enterprise in the short term, such as weakening financial performance and reducing shareholder equity to a certain extent. However, as long as sufficient efforts are made, the enterprise will ultimately achieve its long-term value.

6.2.2. Practical Implications

From a government perspective, firstly, the vast majority of ESG disclosure standards currently implemented in China draw inspiration from mainstream international ESG information disclosure standards. China should tailor its own ESG disclosure standard system based on its national conditions. For special industries such as energy, the country should further improve its specific key measurement standards based on general disclosure standards. Secondly, the government provides certain policy incentives for energy companies that actively improve their ESG performance and should provide corresponding guidance for energy companies with poor ESG performance, to encourage Chinese energy companies to fully disclose their true situation in environmental, social, and corporate governance dimensions. Thirdly, increase the guidance on the disclosure of ESG performance information by enterprises. For necessary industries, such as heavily polluting industries, mandatory disclosure of information can be required to create a favorable information environment for external information users.

From the perspective of enterprises, firstly, energy companies should actively respond to national policies, integrate ESG concepts into their business management in all aspects, processes, and coverage, and improve their internal governance in a targeted manner, thereby promoting sustainable value creation of ESG performance. Secondly, based on the characteristics of energy companies themselves, combined with the disclosure principles, requirements, and applications provided by the “Guidelines for ESG Disclosure of Enterprises”, we ensure the integrity and authenticity of ESG information disclosure, actively publish ESG reports, and enable external information users, including auditors, to fully understand the company’s performance in ESG while expanding its reputation capital, thereby reducing audit costs. Thirdly, enterprises can enhance their green innovation

capabilities through various measures such as strengthening green innovation management and exploring new models of green and low-carbon development. At the same time, they can improve the standardization level of supply chain management processes, enhance overall operational efficiency, achieve cost reduction and efficiency improvement, and enhance market competitiveness. In addition, companies need to conscientiously fulfill their social responsibilities to achieve sustained growth in the three bottom-line goals of environment, society, and corporate governance.

From the perspective of third-party auditing, firstly, when measuring audit fees, audit institutions should consider the characteristics of the industry to which the energy enterprise belongs, to determine the focus of the evaluation. Secondly, in the process of conducting audit work, maintain a high level of professional sensitivity towards energy companies, incorporate the assessment of corporate ESG performance into the scope of corporate risk assessment, and improve the utilization of relevant information on corporate ESG performance. Thirdly, for the ESG situation provided by the audited entity and the relevant reports released by analysts, full consideration should be given to audit risks, a scientific audit work plan should be formulated, appropriate audit procedures should be selected, the efficiency of audit work should be improved, and audit quality should be ensured, to determine more reasonable audit fees and promote the maximization of benefits for both the enterprise and the auditor.

6.2.3. Research Shortcomings and Prospects

Firstly, because my academic ability still needs to be improved through more in-depth learning and research, and the relationship between ESG performance and audit fees in the energy industry, which is a special industry, is relatively novel with few reference materials, it is rare to analyze ESG performance in three dimensions: environment, society, and corporate governance. Therefore, there is still room for further improvement in the analysis results of this article. Secondly, the current Chinese market is at a critical turning point in the deep integration and development of ESG concepts. The disclosure standards for corporate ESG are constantly being improved and updated to quickly create a “localized” ESG disclosure standard system in China. At the same time, different rating agencies adopt different ESG evaluation systems, and the content of corporate information disclosure may vary. Therefore, the universality of the conclusions drawn in this article among all energy-listed companies still has certain limitations. Finally, all information in this article is sourced from publicly available data, and the results obtained are empirically studied using relevant analysis software. Therefore, in the process of translating theory into practice, it is necessary to consider the actual situation of the enterprise.

AUTHOR CONTRIBUTIONS

Conceptualization, Z.W.L. and Y.S.; methodology, Y.S.; software, Y.S.; validation, Y.S.; writing—original draft preparation, Z.W.L. and Y.S.; writing—review and editing, Y.S.All authors agreed to the manuscript.

FUNDING

This research was funded by the Philosophy and Social Sciences Planning Project of the Ministry of Education [grant number 21YJCZH203], the Special Fund for the Construction of Modern Agricultural Industrial Technology System in Hebei Province: Research Project of the Industrial Economy Post of the Beef Cattle and Sheep Industry Innovation Team under the Modern Agricultural Industrial Technology System of Hebei Province [grant number HBCT2024250301], Hebei Provincial Social Science Development Research Project [grant number 202402190], and the Hebei Provincial Social Science Foundation Project [grant number HB24YJ001].

DATA AVAILABILITY STATEMENT

The data presented in this study are available on request from the corresponding author.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

ETHICS, CONSENT TO PARTICIPATE, AND CONSENT TO PUBLISH DECLARATIONS

Not applicable.

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Received on 23-06-2025 Accepted on 22-07-2025 Published on 23-08-2025

https://doi.org/10.6000/2818-3401.2025.03.05