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Governance of Corporate Greenwashing through ESG Assurance

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Abstract: This study utilizes data from Chinese A-share listed companies from 2014 to 2022 to theoretically analyze and empirically test the governance effect of ESG assurance on corporate greenwashing behavior, as well as the role played by the legal environment and management shareholding in this context. The impacts of ownership and the governance mechanism of ESG assurance on corporate greenwashing behavior are also explored. This study employs text mining, OLS, PSM, IV-LIML, treatment effect models, feasible generalized least squares, placebo tests, bootstrap methods, etc., to conduct empirical analysis and conclude the following results: ESG assurance has a significant inhibitory effect on corporate greenwashing behavior, playing a crucial role in resource allocation, particularly in non-state-owned enterprises. The legal environment has a certain substitution effect on ESG assurance in inhibiting corporate greenwashing behavior, meaning that when the legal environment is weak, ESG assurance is more effective in curbing such behavior. Management shareholding also has a certain substitution effect on ESG assurance in inhibiting corporate greenwashing behavior, indicating that when management shareholding is low, ESG assurance is better at curbing such behavior. Further research reveals that corporate ESG performance plays a mediating role between ESG assurance and corporate greenwashing governance. This article provides policy references and empirical evidence for strengthening ESG assurance and enhancing corporate ESG performance and greenwashing governance to promote high-quality corporate development.

Keywords: ESG assurance; greenwashing behavior; legal environment; management shareholding; ESG performance

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1. Introduction

In recent years, environmental pollution has become increasingly severe, with greenhouse gas emissions, energy management, wastewater management, and biodiversity impacts becoming a global focus of attention. The 20th National Congress of the Communist Party of China emphasized the promotion of green development, the establishment of a development pattern, the optimization of the energy structure, and the deepening of pollution control efforts. With the optimization of environmental regulations, companies are becoming more discreet in addressing environmental issues. To display an excellent green image externally, companies with opportunistic tendencies often selectively disclose positive information while concealing negative information [1]. "Greenwashing" was first proposed by American environmentalist Jay Westerveld. Symbolic management theory suggests that greenwashing refers to companies that use only environmentally symbolic symbols for publicity without taking concrete action. As early as 2009, Southern Weekend first released a greenwashing ranking and put forward the "Ten Sins of Greenwashing", including intentional concealment, double standards, empty promises, and fuzzy vision, which garnered widespread public attention. In recent years, greenwashing behavior by companies has become common, leading to a phenomenon where inferior practices drive

out superior practices. Greenwashing behavior decreases the reliability of environmental information disclosure. Owing to the technical and discreet nature of greenwashing, stakeholders often cannot identify it accurately, leading to serious information asymmetry and adverse selection issues, reducing market efficiency and preventing environmentally friendly and carbon-neutral companies from standing out [2].

The ESG concept was first proposed by the United Nations Global Compact in 2004 and has become a global consensus under the demands of the green transformation of the economy, carbon reduction, and new energy development. In 2018, the China Securities Regulatory Commission revised the "Listed Company Governance Guidelines" to include additional responsibilities in environmental protection for listed companies. Recently, research related to ESG (environmental, social, and governance) information disclosure has become a prominent area of focus. However, studies focusing specifically on ESG assurance are relatively scarce and have yet to receive adequate attention. As the ESG concept grows, the importance of assurance supervision is gradually becoming more evident. ESG assurance essentially serves as a unique monitoring mechanism for ensuring and promoting the comprehensive and effective fulfilment of ESG responsibilities; however, at present, there are no mandatory requirements for ESG assurance. Reference [3] collected ESG reports of 100 sustainable development companies selected by the 2021 Wall Street Journal and Investor's Business Daily and reported that 58% of the sample companies voluntarily sought external assurance services for certain parts of their ESG reports [3]. In 2021, a total of 4628 listed companies on the Shanghai and Shenzhen stock exchanges released ESG reports, but only 127 companies carried out third-party assurance, accounting for 2.62% [4], leading to a lack of guarantee for the quality of ESG information disclosure by listed companies. The reliability of various ESG evaluation indicators of listed companies on the basis of unassured ESG information is particularly questionable [5]. Owing to conflicts of interest and ethical risks, manipulative behaviors related to ESG information have not been widely assured.

Compared with developed countries and Hong Kong, the development of ESG assurance in mainland China has been significantly lagging, urgently necessitating awareness and improvement—a key motivation for this paper. Although the proportion of Chinese companies executing ESG assurance remains low, some pioneering attempts by certain companies offer valuable benchmarks and references for promoting ESG assurance in China. According to Deloitte's analysis, between 2016 and 2018, the percentage of ESG assurance completed by S&P 500 companies in the United States rose from 16% to 36% [6], with this figure continuing to increase. A 2024 survey by the International Federation of Accountants, American Institute of Certified Public Accountants, and Chartered Institute of Management Accountants on 1400 companies across 22 regions globally revealed that 46% of companies engaged third-party entities for ESG assurance, with the highest rates occurring in France (96%), Spain (76%), United States (70%), Germany (59%), Japan (48%), and Canada (42%), while the ESG assurance rate for companies in Hong Kong was 26% [7]. Furthermore, according to KPMG's analysis, the ESG assurance rate for N100 companies (the largest 100 companies in various sample countries) stood at 48% between 2020 and 2022, whereas the rate for G250 companies (those ranking in the top 250 of the Fortune 500) increased from 62% in 2020 to 63% in 2022, suggesting that further regulation in the coming years may increase this percentage [8]. KPMG's insights into Chinese companies revealed that the number of G250 companies seeking ESG assurance rose from 15 in 2015 to 30 in 2022 [9]. While progress in Chinese companies is encouraging, their ESG assurance rates still fall short of global levels. Since ESG reports, along with financial reports, provide a more comprehensive reflection of the economic responsibilities of company management authorities [10], ESG disclosure and financial report information disclosure jointly influence the decision-making and choices of all stakeholders in a company. ESG assurance is as important as financial report auditing and must ensure quality disclosure requirements. Strengthening ESG assurance and supervision can positively guide companies to follow ESG rules, thus suppressing "greenwashing" digital games [11,12].

The main objectives of this study are threefold: First, drawing on neoclassical economics, information economics, institutional economics, fraud triangle theory, agency theory, and game theory, a theoretical framework is constructed through theoretical analysis and evolutionary game analysis to govern corporate greenwashing behaviors through ESG assurance. The existing literature on the assurance functions and ESG field lacks integration; therefore, theoretical explorations of ESG assurance as an emerging assurance practice require synthesis and refinement, given the scarcity of relevant studies. However, this integration is not a mechanical process and must consider the characteristics of each factor and its developmental context. This study aims to develop a theoretical framework for governing corporate greenwashing through ESG assurance in light of China's current developmental realities.

Second, a systematic investigation into the effectiveness of ESG assurance in combating corporate greenwashing will address the influence of the external environment (such as the legal environment) and internal characteristics of companies (such as property ownership nature and management shareholding). On the basis of the theoretical framework, this study will formulate corresponding hypotheses and empirically test and analyze the impact of ESG assurance on corporate greenwashing behaviors and other related influencing factors.

Third, this study examines the inherent influencing mechanisms of ESG assurance on corporate greenwashing behaviors from the perspective of corporate ESG performance, offering suggestions for optimizing the governance of greenwashing behaviors. By researching these mechanisms, we clarify the pathways through which ESG assurance impacts the governance of corporate greenwashing, with the aim of providing actionable recommendations for relevant stakeholders.

In relation to the aforementioned research objectives, the following key questions are addressed in this study:

RQ1: How can a theoretical framework be constructed for the governance of corporate greenwashing through ESG assurance?

RQ2: What is the effectiveness of ESG assurance in addressing corporate greenwashing behaviors? How do external and internal factors play a role in this context?

RQ3: What are the inherent mechanisms by which ESG assurance governs corporate greenwashing behaviors? What referenceable optimization strategies can be proposed?

This study uses text analysis to identify company ESG assurance information effectively. Using 2014–2022 data on A-share listed companies on the Shanghai and Shenzhen stock exchanges, this study theoretically analyzes and empirically tests the impact of ESG assurance on corporate greenwashing behavior. Research has shown that ESG assurance can effectively suppress corporate greenwashing behavior, especially in non-state-owned enterprises. The rule of law environment has a certain substitutive effect on ESG assurance, meaning that in weaker legal environments, ESG assurance is more effective in suppressing corporate greenwashing behavior. The shareholding of top management also has a certain substitutive effect on ESG assurance, indicating that when top management shareholding is lower, ESG assurance is more effective in suppressing corporate greenwashing behavior. Further research reveals that corporate ESG performance plays a partial mediating role between ESG assurance and the governance of corporate greenwashing behavior.

This study contributes to three main areas: First, while the literature on ESG concepts, ESG information disclosure, and ESG regulatory studies has made significant progress and laid an important foundation for this paper, research on ESG assurance is limited. This study, which is based on the current institutional environment and era background in China, explores the governance effect of ESG assurance on corporate greenwashing behavior. Second, from the perspectives of the rule of law environment, top management shareholding, and the nature of property rights, this study analyzes and empirically tests the factors affecting the governance effect of ESG assurance on corporate greenwashing behavior, examining their combined impact and enriching the relevant research on the governance of corporate greenwashing behavior. Third, the relationships among ESG

assurance, corporate ESG performance, and corporate greenwashing behavior are further discussed, enriching the relevant research on the governance mechanism of ESG assurance on corporate greenwashing behavior and thereby providing a reference regarding policy and pathways to enhance corporate ESG performance and the governance of greenwashing behavior. It aims to construct an ESG assurance theoretical system that serves "Chinese-style modernization", promote the popularization of ESG assurance, enhance corporate ESG performance, and suppress corporate greenwashing behavior, providing theoretical guidance and empirical evidence for industry practices.

2. Literature Review, Theoretical Analysis and Research Hypotheses

2.1. ESG Assurance and Corporate Greenwashing Governance

The literature on the motives behind corporate greenwashing primarily draws from neoclassical economics, information economics, and institutional economics. Neoclassical economics suggests that when external pressures are low and the benefits of greenwashing outweigh the costs, companies are motivated to engage in speculative behavior [13]. Information economics posits that significant market information asymmetries arise due to the technical nature of greenwashing and the cognitive shortcomings in public environmental value judgments. These asymmetries often lead to outcomes (greenwashing, low prices) in markets with incomplete information [14]. Institutional economics suggests that when external regulatory mechanisms are flawed, companies with opportunistic tendencies are motivated to disseminate false information for greenwashing purposes [15]. With respect to the motives for greenwashing behavior, the details are shown in Figure 1.

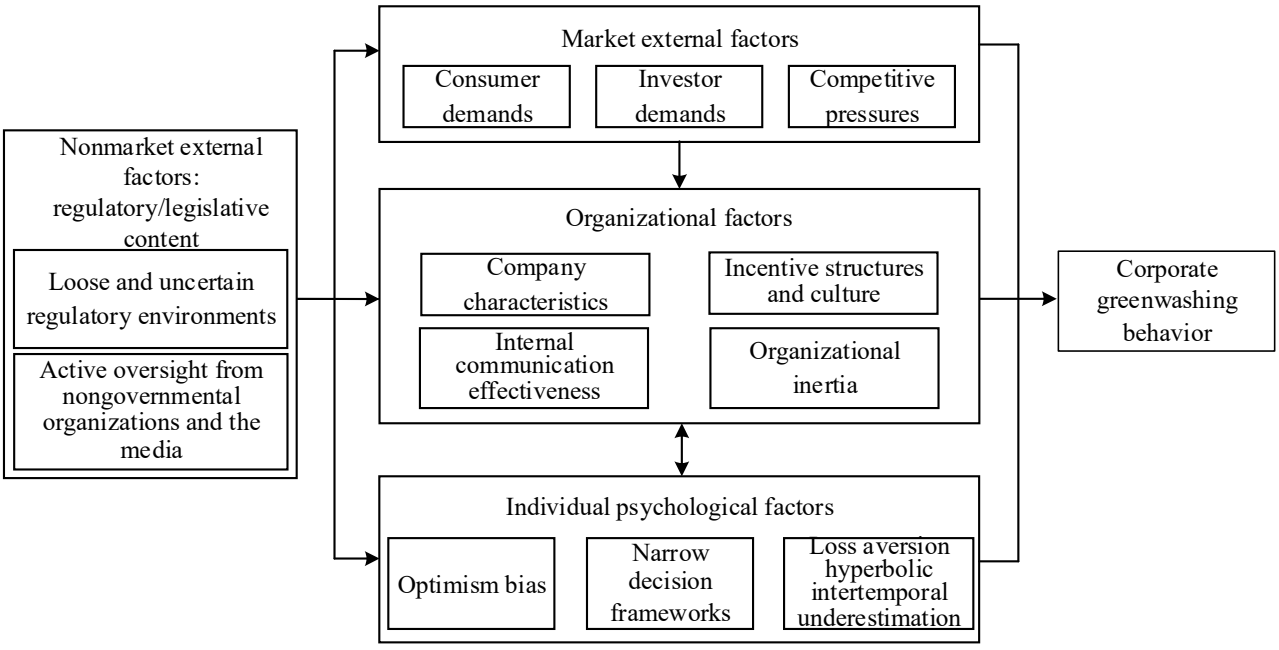

Figure 1. Diagram outlining corporate greenwashing behavior motivation.

Reference [16] suggests that nonmarket external factors, including loose and uncertain regulatory environments and active oversight from nongovernmental organizations and the media, can lead to market external, organizational, and individual psychological factors that drive greenwashing behavior by companies. Market external factors include consumer and investor demands and competitive pressures; organizational factors include company characteristics, incentive structures and culture, internal communication effectiveness, and organizational inertia; and individual psychological factors include optimism bias, narrow decision frameworks, and loss aversion hyperbolic intertemporal underestimation [16].

On the basis of fraud triangle theory, the Association of Certified Fraud Examiners (ACFE) in the United States believes that pressure, opportunity, and rationalization are the

main reasons for corporate fraud. Pressure refers to the difficulties faced by companies when they are unable to meet stakeholder demands. Opportunity arises from factors such as information asymmetry and regulatory deficiencies, making greenwashing behaviors difficult to identify and punish, whereas rationalization involves seeking favorable excuses for greenwashing hypocrisy [17]. In reality, pressure mainly includes economic, environmental, organizational, and social pressures. Greenwashing opportunities mostly stem from stakeholders' cognitive deficiencies, information asymmetry, and lack of effective assurance regulation [18]. Common rationalization behaviors include moral deflection and imitation support, with moral deflection involving moral justifications and responsibility diffusion, and imitation support refers to imitation behaviors adopted to avoid releasing negative external costs to oneself. ESG assurance objectively assesses the truth and reliability of corporate environmental information, effectively reducing greenwashing opportunities caused by factors such as information asymmetry and regulatory deficiencies. By transmitting moral deflection and imitation support rationalization hypocrisy, ESG assurance entities take on a certain degree of risk transfer to maintain their reputation, stabilize investor sentiment and contractual relationships, and, to some extent, help companies alleviate pressure and dilemmas. Eulerich et al. (2022) posit that companies that voluntarily undergo ESG assurance exhibit weaker future compliance tendencies than those without ESG assurance [19]. Frost and Cao (2023) argue that as an external governance tool and information intermediary, ESG assurance can enhance the quality of company information disclosure [20].

Figure 2 illustrates the equilibrium scenario of corporate profit for undetected greenwashing behavior.

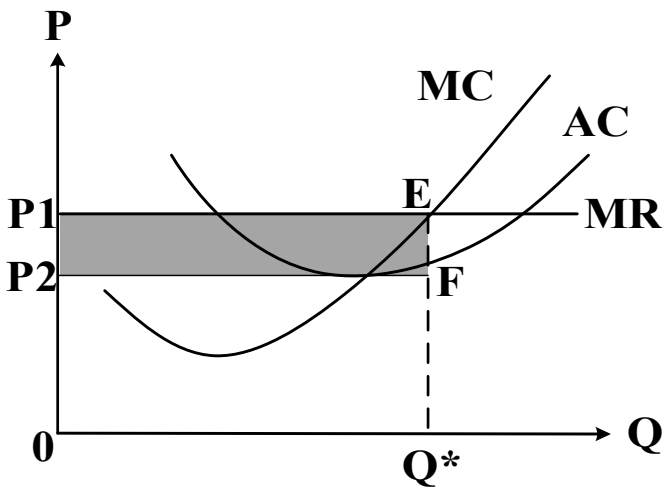

Figure 2. Equilibrium scenario of corporate profit for undetected greenwashing behavior.

When companies commit to greenwashing, they create adverse selection issues in the market, resulting in elevated marginal returns (MRs). On the basis of the profit maximization equilibrium condition of MR = MC, the point of profit maximization for a company is at the intersection E of the MR and MC curves, corresponding to the equilibrium output of Q*. At this quantity, the average revenue is EQ*, and the average costs are FQ*. As the average revenue exceeds the average cost, companies realize excess profits. In the diagram, the excess profit per unit is EF, with output at 0Q*, and the product EF $\times$ 0Q* equals the total excess profit, represented by the shaded area in Figure 2.

Figure 3 illustrates the equilibrium scenario of corporate losses resulting from penalties for greenwashing behavior.

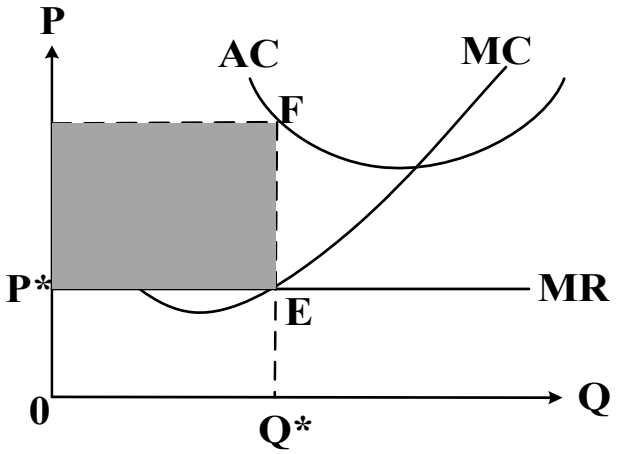

Figure 3. Equilibrium scenario of corporate losses for greenwashing behavior penalties.

The costs associated with greenwashing include concealment and exposure costs, such as symbolic advertising expenses, regulatory pressures, and market negative responses triggered by exposure. This scenario results in lower marginal returns (MRs) for the companies involved. Following the MR = MC profit maximization principle, the equilibrium point occurs at E, where the MR and MC curves intersect, producing an equilibrium output of Q*. At this quantity, the average revenue is EQ*, while the average cost is FQ*. When the average cost surpasses the average revenue, companies incur losses. In this diagram, the loss per unit is FE, with an output at 0Q*, leading to a total loss of FE $\times$ 0Q*, corresponding to the shaded area in Figure 3.

On the basis of neoclassical economic theory, through a cost-benefit equilibrium analysis, greenwashing behaviors are rational options for companies pursuing short-term profit goals. There exists a "ripple effect" in profit acquisition, meaning that if companies engage in greenwashing behaviors without appropriate punishment and achieve excess profits, other companies will imitate them. From the perspective of ESG assurance governance, the cost-benefit equilibrium of corporate greenwashing behaviors in the overall market is illustrated in Figure 4.

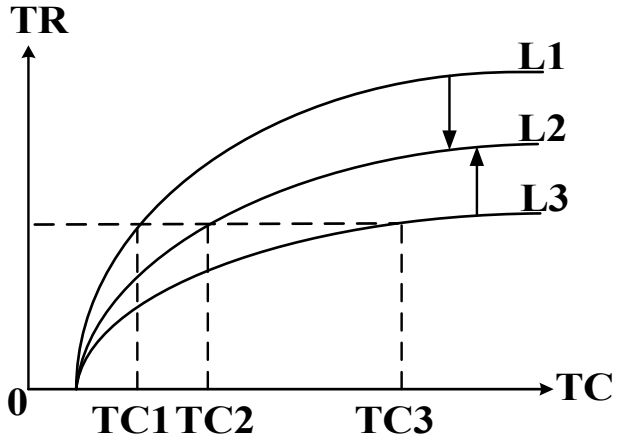

Figure 4. Cost-benefit equilibrium of corporate greenwashing behaviors in the overall market from the perspective of ESG assurance governance.

The vertical axis R represents the benefits obtained from corporate greenwashing behaviors, and the horizontal axis C represents the associated costs borne by corporate greenwashing behaviors. L1 represents the cost-benefit line of companies engaging in greenwashing behaviors but not receiving corresponding penalties due to a lack of detection (as depicted in Figure 2). L2 represents the cost-benefit line of companies without

greenwashing behaviors. L3 represents the cost-benefit line of companies engaging in greenwashing behaviors and receiving corresponding penalties upon detection (illustrated in Figure 3). Given the finite market capacity and the principle of diminishing marginal returns, the cost-benefit relationship for companies can be represented as a convex curve. On the one hand, as ESG regulations become more robust, media supervision matures, and stakeholder awareness increases, companies engaging in greenwashing may opt for ESG assurance due to pressures from stakeholders such as clients, suppliers, and potential investors, as well as competitive and market-wide effects. On the other hand, it is possible that companies conducting ESG assurance may also engage in greenwashing, particularly if they had previously conducted assurance but ceased due to their greenwashing activities, resulting in stakeholder suspicions and adverse market effects.

As engaging in green environmental practices often requires substantial resources, companies that avoid greenwashing incur certain green governance costs. Consequently, at the same level of returns, the cost-benefit line for companies that do not engage in greenwashing behaviors, denoted as L2, is positioned to the right of the cost-benefit line for companies that engage in greenwashing behaviors but avoid penalties due to lack of detection. As external regulatory pressures intensify, there are two possible trends: the first is "L1 $\rightarrow$ L2", where, on the basis of the deterrent effect, L1 shifts to the right towards L2; the second is "L1 $\rightarrow$ L3 $\rightarrow$ L2", where greenwashing behavior is detected and penalized, causing L1 to move to the position of L3, attributing this shift to increased costs related to exposure and penalties. Considering the cost-benefit principle, companies that face penalties for greenwashing are motivated to implement substantive ESG actions to avert further penalties, thereby shifting their cost-benefit curve leftward from L3 to L2, ultimately curbing greenwashing behaviors. Grounded in theories of asymmetric information and agency, ESG assurance can effectively alleviate agency conflicts and moral hazards arising from the separation of powers and information asymmetry, supervising and improving governance. By leveraging their roles in certification, signaling, and providing assurance value, these assurances reduce agency costs, including supervision, assurance costs, and residual losses. Hence, while decision-making on greenwashing is influenced by the intrinsic characteristics of companies, this equilibrium is closely tied to external governance. With the enhancement of ESG regulations, the maturation of media scrutiny, and an increase in stakeholder attention, ESG assurance, as a crucial aspect of external governance, intensifies the risk of exposure to greenwashing behaviors and assists companies in navigating ESG regulatory risks. This, in turn, influences decision-making regarding greenwashing behavior formed by the intrinsic characteristics of companies, fostering trends such as "L1 $\rightarrow$ L2" or "L1 $\rightarrow$ L3 $\rightarrow$ L2".

With this in mind, we anticipate that ESG assurance has a restraining effect on corporate greenwashing behaviors and propose Hypothesis H1.

H1. *ESG assurance can effectively restrain corporate greenwashing behavior.*

2.2. ESG Assurance, the Legal Environment, and the Governance of Corporate Greenwashing Behavior

For ESG assurance, the legal environment, and the governance of corporate greenwashing behavior, 73 assurance entities are currently engaged in ESG assurance services for listed companies in China. These primarily include accounting firms, certification and testing institutions, and specialists from related fields. Among these, the accounting firms undertaking ESG assurance include the "Big Four" international accounting firms (PwC, London, UK; Deloitte, London, UK; KPMG, Amsterdam, NL; EY London, UK), as well as some domestic firms with broader service distributions, such as BDO-certified public accountants, Shanghai-certified public accountants, and Rongcheng-certified public accountants. Certification and testing institutions such as TÜV SÜD Certification and Testing (Munich, Germany) Co., Ltd. and China Certification Center (Beijing, China) Inc., along with specialists from relevant fields—such as vice ministers from the Ministry of

Industry and Information Technology and members of the expert committee for rating corporate social responsibility reports—are also part of this landscape. As early as the 1990s, Chinese accounting firms underwent significant disentanglement and reform, transitioning from state-owned to private enterprises. Certification and testing institutions, as well as associated experts, also operate under private frameworks.

To elucidate the interaction between ESG assurance entities participating in a legal environment and corporate objective functions, this study investigates the gaming processes between ESG assurance entities and companies, as well as between companies and stakeholders.

First, in analyzing the gaming process between ESG assurance entities and companies, the profit–payment matrix for ESG assurance entities and companies is shown in Table 1.

Table 1. Profit–payment matrix for ESG assurance entities and companies.

ESG Assurance Entities \ Companies	Greenwashing (y)	Non-Greenwashing (1 − y)
Collusion (x)	f + Δf − c, r + Δr − l	f, r
Non-collusion (1 − x)	f − p, r	f, r

This study makes the following assumptions. ESG assurance entities are rational economic agents. The fees for ESG assurance are represented as f. The probability of companies engaging in greenwashing is y, whereas the probability of not engaging in greenwashing is 1 − y. Company utility is r. If the company engages in greenwashing and colludes with the ESG assurance entity, the incremental utility is Δr, and the additional benefits for the assurance entity is Δf. If the behavior of the ESG assurance entity and the corporate greenwashing is exposed, the ESG assurance entity incurs a loss of c (loss = probability of detection × penalty amount), and the company incurs a loss of l. If a company engaging in greenwashing and the ESG assurance entity does not collude with it and discovers the issue, the company may terminate its contract with the assurance entity, resulting in a loss of p for the ESG assurance entity.

According to the strategic expressions in Table 1, the expected utilities of the ESG assurance entity in collusion and non-collusion with the company, denoted as U_1 and U_2, are as follows:

$$U_1 = (f + \Delta f - c)\,y + f(1 - y) \tag{1}$$

$$U_2 = (f - p)\,y + f(1 - y) \tag{2}$$

The indifference point between the expected utilities of collusion and non-collusion is denoted as x. Therefore, we have the following:

$$xU_1 = (1 - x)U_2 \tag{3}$$

$$x[(f + \Delta f - c)\,y + f(1 - y)] = (1 - x)[(f - p)y + f(1 - y)] \tag{4}$$

$$\Rightarrow\ x = \frac{f - py}{2f - py + \Delta fy - cy} \tag{5}$$

x is a function of p:

$$x = f\left(p\right) = 1 + \frac{cy - f - \Delta fy}{2f - py - cy + \Delta fy} \tag{6}$$

when $cy - f - \Delta fy > 0$, that is, when $cy > f + \Delta fy$, x is an increasing function of p; conversely, when $cy - f - \Delta fy < 0$, meaning that $cy < f + \Delta fy$, x is a decreasing function of p. The economic implications are as follows: First, if greenwashing collusion is detected, in the case where the penalties incurred by the ESG assurance entity exceed its ESG assurance fees and additional benefits ($cy > f + \Delta fy$), then the punishment p from the company for the assurance entity not engaging in collusion will increase the indifference point x,

increasing the probability that the ESG assurance entity will refrain from collusion. The policy implication here is that higher penalties for collusion can help to deter such behaviors. Second, if greenwashing collusion is detected, in the case where the ESG assurance fees and additional benefits of ESG assurance entity exceed the penalties it incurs (cy < f + Δfy), the punishment p from the company for the assurance entity not engaging in collusion will reduce the indifference point x, thus increasing the probability that the ESG assurance entity will engage in collusion.

Currently, China's regulatory framework for ESG is relatively comprehensive, encompassing both legal and regulatory oversight and media supervision. Once greenwashing collusion is discovered, the penalties that the ESG assurance entity incurs will be greater than its ESG assurance fees and additional benefits (cy > f + Δfy). Therefore, punishment p from companies and faced by assurance entities for opting non-collusion shifts the indifference point x higher, meaning that assurance entities will refrain from greenwashing collusion. Additionally, positive reinforcement of commendation and exemplary models from government, industry, or public recognition, as well as negative reinforcement from penalties or condemnation, play significant roles in cultivating professional habits among ESG assurance entities.

Second, in the context of repeated games, companies and stakeholders make rational decisions aimed at maximizing the expected total net benefits from a long-term perspective. The profit–payment matrix for companies and stakeholders in repeated games is illustrated in Table 2.

Table 2. Profit–payment matrix for companies and stakeholders in repeated games.

Companies \ Stakeholders	Transactions	No Transactions
Greenwashing collusion	$R - C_1, U_1 - C$ (n)	$-C_1, 0$
Non-collusion	$R - C_2, U_2 - C$ (m)	$-C_2, 0$

Companies have two decision-making options with respect to the ESG assurance entities (greenwashing collusion or non-collusion), whereas stakeholders face two options (transaction or no transaction). If a transaction occurs, the company's earnings are R; if no transaction occurs, the earnings are 0. If the company opts for the greenwashing collusion strategy, the cost is C_1; if it chooses the non-collusion strategy, the cost is C_2. The non-collusion strategy can be subdivided into two categories: "not greenwashing" and "greenwashing non-collusion". By adopting the "not greenwashing" strategy, the company must undertake substantial green actions, incurring costs to do so, whereas choosing the "greenwashing non-collusion" strategy will result in higher risks of exposure and penalty costs. Thus, the cost of selecting the non-collusion strategy for company is greater: $C_2 > C_1$. If the company selects (greenwashing collusion, transaction), stakeholders gain utility U_1. If the company selects (non-collusion, transaction), stakeholders gain utility U_2, $U_2 > U_1$. The transaction costs for stakeholders are simplified to the identification costs of the company's greenwashing collusion strategy, which is a decreasing function of the number of game iterations. Thus, the more often the company and stakeholders engage in transactions, the lower the identification costs for stakeholders regarding whether collusion exists between the company and the ESG assurance entity. If a company chooses the greenwashing collusion strategy, its net benefits per transaction amount to $R - C_1$. If a company opts for the non-collusion strategy, the net benefits per transaction amount to $R - C_2$. In a repeated game scenario, the total net benefits for the company equal the sum of the discounted values of the net benefits from each transaction.

The total net benefit for the company that chooses greenwashing collusion with the ESG assurance entity is represented as follows:

$$I_1 = R - C_1 + (R - C_1)\,\delta + (R - C_1)\,\delta^2 + \ldots + (R - C_1)\delta^n - C_1\delta^{n+1} = \left(R - C_1\right)(1 - \delta^{n+1}\Big) / (1 - \delta) - C_1\delta^{n+1} \quad (7)$$

The total net benefit for the company that opts for the non-collusion strategy is as follows:

$$I_2 = R - C_2 + (R - C_2)\delta + (R - C_2)\delta^2 + \ldots + (R - C_2)\delta^m - C_2\delta^{m+1} = \left(R - C_2)(1 - \delta^{m+1}\right)/(1 - \delta) - C_2\delta^{m+1} \quad (8)$$

Let

$$I_1 = I_2, \quad (9)$$

Then

$$(R - C_1)(1 - \delta^{n+1}) - (1 - \delta)C_1\delta^{n+1} = (R - C_2)(1 - \delta^{m+1}) - (1 - \delta)C_2\delta^{m+1} \quad (10)$$

Thus

$$m^* = \log_\delta(R\delta^{n+1} - C_1\delta^{n+2} + C_1 - C_2)/(R\delta - C_2\delta^2) \quad (11)$$

In this context, when a company chooses the greenwashing collusion strategy, the number of transactions with stakeholders is denoted by n. Conversely, when the company opts for the non-collusion strategy, the number of transactions with stakeholders is represented by m. The discount factor is denoted by δ, $0 < \delta < 1$. When $m < m^*$ ($I_2 < I_1$), the company selects the greenwashing collusion strategy, incurring costs once exposed, such as searching for stakeholders, reputational damage, and the potential for stakeholders to halt their affiliation. The Nash equilibrium in this situation is (greenwashing collusion, no transaction), ultimately resulting in a loss for the company. However, when $m > m^*$ ($I_2 > I_1$), the company opts for the non-collusion strategy, and the expected benefit for stakeholders $U_2 - C(m)$ is greater than 0, making the optimal strategy (non-collusion, transaction). From a long-term benefits perspective, it is prudent for a company to adopt the non-collusion strategy. Therefore, rational economic agents will not be fixated on short-term benefits at the expense of long-term cooperative opportunities. Throughout the game process, companies are incentivized to cultivate a positive reputation, convey positive signals to the market, mitigate information asymmetry, enhance stakeholder confidence, and, thus, promote high-quality development of companies.

As a hypocritical speculative activity, corporate greenwashing behavior is inevitably accompanied by illegal and irregular phenomena. Assurance supervision and legal oversight serve as two avenues for governance concerning corporate greenwashing and exhibit governance effects. In the absence of mandatory ESG assurance, an improved legal environment plays a positive, substitutive role. The enhancement of the legal environment signifies the imposition of more effective legal consequences on corporate greenwashing behavior [21], thereby increasing the associated costs for companies engaging in such practices. Asante-Appiah and Tamara (2023) reported a significant negative correlation between the probability of corporate violations and the legal environment in which they operate [18]. An improved legal environment reflects intensified government regulation and punitive measures, leading to heightened costs of camouflage and exposure related to corporate greenwashing behavior [22]. Similarly, in a relatively weak legal environment, effective ESG assurance can increase the "lie-telling" costs for greenwashing companies, augmenting information transparency and the risks of exposure, which in turn enhances public scrutiny and market responsiveness [23]. Reference [24] suggest that regulatory pressure on sustainability is mediated by ESGS, which in turn impacts the triple bottom line performance (TBLP)—encompassing economic, social, and environmental facets. This regulatory pressure falls within the scope of the rule of law environment. Given this context, we anticipate a substitutive effect between ESG assurance and the legal environment in the governance of corporate greenwashing behavior, leading to the formulation of Hypothesis H2.

H2. *There exists a substitutive effect between ESG assurance and the legal environment in the governance of corporate greenwashing behavior, with the suppressive effect of ESG assurance on corporate greenwashing behavior being more pronounced in a weaker legal context.*

2.3. ESG Assurance, Management Shareholding, and the Governance of Corporate Greenwashing Behavior

Like financial statement audit, third-party ESG assurance can enhance the reliability of ESG information, ensuring that such information is disclosed in accordance with specified standards and increasing stakeholder confidence. Given the inherent relationship between financial statements and ESG reports, the disclosures regarding ESG information are interconnected within both types of reports. For example, investments in environmental protection, donation amounts, and employee benefits in financial reports are linked to disclosures and compliance analyses in ESG reports [25]. Management behavior is a crucial factor in determining the quality of reported information, which is intricately connected to ESG assurance. In contrast to ESG assurance, which is an external governance tool, management shareholding, which is a vital component of internal governance, similarly constrains corporate decision-making behaviors. Reference [26] reported that when ownership and control within a company are separated, discrepancies may arise between the objective functions of agents and principals. Additionally, uncertainty and information asymmetry can lead agents to diverge from the principal's objectives while remaining difficult for principals to monitor and supervise, thus resulting in agents potentially harming the interests of principals. The motivation for agents to maximize their own interests may generate additional business costs, known as agency costs. Agency issues primarily encompass three categories: conflicts between shareholders and management shareholders, conflicts between large and small shareholders, and conflicts between the company and contractual partners, such as the exploitation of creditors, the unfair treatment of employees, or misleading consumers.

As an internal incentive mechanism to alleviate agency problems, management shareholding has been widely promoted, having a synergistic or trench effect within corporate governance [27]. However, academia has yet to reach a consensus on the mechanisms underlying these two types of effects. On the one hand, the synergistic effect implies that when managers hold company shares, their interests gradually align with those of shareholders; when management owns 100% of the company's shares, agency costs become zero. The synergistic effect manifests in the ability of management shareholding to mitigate agency conflicts, wherein management's interests align with those of shareholders, collectively striving for corporate development. Watts and Zimmerman (1983), on the basis of agency theory, propose that management shareholding aligns managers' goals with stakeholders' goals, thereby controlling corporate risk and effectively suppressing agency problems [28], thus enhancing governance levels. Krishnamurti and Velayutham (2018) argue that management shareholding incentivizes and supervises corporate decision-making, leading to chain reactions such as the reinforcement of internal control mechanisms [29]. Reference [24] posit that stakeholder pressure on sustainability is mediated by ESGS, which affects the TBLP of a firm. In emerging economies, the importance of aligning strategies with stakeholder expectations is amplified. As these economies grow, stakeholders are becoming more influential and demanding. Firms that align their objectives with these evolving expectations through comprehensive ESGS can secure enhanced legitimacy and trust, leading to better access to critical resources and markets. Reference [18] reported that assurance supervision can alleviate concerns among external investors, thereby enabling external investors to oversee management shareholdings and enhancing the efficacy of equity incentives. Reference [30] posited that executive incentives encompass a comprehensive package, including salary, bonuses, and equity; among these, equity represents the most significant form of incentive, as the proportion of executive shareholding and its weight within incentive plans both positively impact corporate performance [30], providing support for the synergistic effect hypothesis.

On the other hand, the trench effect refers to the increasing control that management gains over a company as its ownership stake increases, leading to the weakening of external constraints. Consequently, management may become more risk-taking, pursue personal gains over a broader spectrum, increase agency costs, and reduce corporate compliance.

Fama and Jensen (1983) reported that managers, motivated by self-interested opportunism, tend to manipulate corporate information after acquiring shares [31], thus implementing strategies that optimize personal interests. Dong and Ma (2019) assert that when management holds shares in a listed company, they gain more control over the company and face less scrutiny and fewer constraints [32]. This situation can encourage self-serving behaviors, such as increasing their own salaries and benefits or avoiding valuable business mergers [33], indicating that the trench defense effect exists in management shareholding. Reference [34] analyzed the relationship between management shareholding and green R&D investment and noted that if green R&D projects fail, management may face a risk of reduced compensation or unemployment, leading to insufficient green R&D investment. However, management might also increase green R&D investment for greater compensation, power, and prestige, resulting in excessive investment . Reference [35] discovered that effective internal and external governance mechanisms provide a crucial environment for the positive effects of management shareholding. Enhancing corporate governance can help prevent the emergence of the trench defense effect. References [36,37] believe that the relationship between management shareholding and corporate performance is nonlinear, where the synergistic effects and trench effects of management shareholding alternate. This alternating phenomenon is expressed such that when internal and external governance levels are high, the supervisory and motivational roles of management are safeguarded [38], encouraging management to avoid actions contrary to corporate interests, leading to synergistic effects in management shareholding [39]. Conversely, when governance levels are low, supervision and incentives become ineffective, and structural loopholes may lead management to engage in unethical behaviors [40], resulting in the trench effect. Thus, management shareholding may exhibit threshold effects on the basis of the levels of internal and external governance, determining whether governance quality surpasses a threshold and implying differing impacts from those of management shareholding.

From the perspective of ESG assurance, this analysis investigates the influence of ESG assurance on management shareholding and its governance of greenwashing behaviors in companies. It is generally accepted that third-party assurance systems are critical for constraining managerial behavior [41], and high-quality ESG assurance can enhance accrual quality [42], reduce financing costs [43], mitigate risky corporate behaviors [3], and reliably safeguard against agency costs [44]. ESG assurance, through enforceable supervision, can align management's decisions with corporate development strategies, whereas management shareholding significantly influences those decisions. In practice, ESG assurance often has two effects on management: an incentive effect and a supervisory effect. The incentive effect arises from how high-quality ESG assurance communicates positive signals to stakeholders, forming an effective incentive mechanism that underpins managerial remuneration and rewards and ultimately enhances managers' conscientiousness and compliance in decision-making. The supervisory effect indicates that high-quality ESG assurance can reduce the likelihood of opportunistic accounting choices by management, thus decreasing the incidence of fraudulent and undesirable behaviors while overseeing self-serving actions. ESG assurance has insurance value, as assurance entities assume additional risks to preserve their reputations, such as the risks associated with the trench effect of management shareholding, alleviating market concerns and consequently increasing market vitality, stabilizing investor sentiment and contractual relationships, and potentially helping companies mitigate pressures and challenges while effectively suppressing motivations for greenwashing. Chen and Han's research suggests that assurance entities reduce risks or losses by charging assurance premiums [45], reflecting the insurance value of assurance.

On the basis of the aforementioned analysis, on the one hand, by leveraging the synergistic effects of management shareholding, ESG assurance eliminates unreasonable discrepancies within corporate reports and improves information quality by enhancing incentive effects. Moreover, management shareholding can reduce agency conflicts, align managers' interests with those of shareholders, encourage thorough operational decision-

making, and prompt management to fulfil ESG responsibilities diligently, consequently diminishing the probability of greenwashing behavior. Thus, management shareholding may weaken the governance effect of ESG assurance on corporate greenwashing, indicating the existence of a substitution effect between the two. On the other hand, by relying on the trench effect of management shareholding, post-acquisition of shares, management may prioritize self-interest maximization, and to fulfil performance commitments, they may be motivated to undermine internal controls and violate corporate ESG compliance systems, engaging in greenwashing opportunism. This is precisely where the supervisory effect of ESG assurance becomes pivotal. Therefore, management shareholding may reinforce the governance effect of ESG assurance on corporate greenwashing behavior, with ESG assurance compensating for the management control deficiencies caused by the trench effect, revealing a complementary relationship between the two.

In light of this analysis, we present competitive Hypotheses H3a and H3b.

H3a. *There exists a substitutive effect between ESG assurance and management shareholding in the governance of corporate greenwashing behavior.*

H3b. *There exists a complementary effect between ESG assurance and management shareholding in the governance of corporate greenwashing behavior.*

3. Research Methodology and Research Design

3.1. Research Methodology

This study adopts a combined approach of normative and empirical research methods. Generally, it begins by reviewing the literature to derive research hypotheses on the basis of theoretical reasoning, followed by empirical testing and analysis, eventually yielding research conclusions and recommendations. In normative research, related theories or value concepts from economics, management, and other fields are employed to evaluate the outcomes of actors' behaviors and the factors influencing these results, thereby revealing objective developmental laws. For empirical research, this paper utilizes econometric methodologies to uncover universal patterns among the inherent components of objective phenomena. It follows a systematic methodological framework: defining research questions, formulating hypotheses, constructing models, collecting data, conducting statistical analysis, drawing quantitative research conclusions, and identifying and analyzing the interactions among related factors. The empirical research primarily employs text mining, descriptive statistics, sample mean T tests, median Wilcoxon tests, ordinary least squares (OLS) estimation, propensity score matching (PSM), instrumental variable methods (extended endogenous model (ERM) and finite information maximum likelihood estimation method (LIML)), treatment effect models, feasible generalized least squares, placebo tests, bootstrap methods, and variable substitution methods to achieve the research objectives.

3.2. Data Sources

This study utilizes data from listed companies in the Shanghai and Shenzhen A-share markets from 2014 to 2022 for several key reasons: First, the Shanghai and Shenzhen A-share markets are among the largest stock markets in China, with a substantial market scale that includes numerous listed companies. Consequently, the data from these markets can reflect the overall state of China's domestic economy and the operational conditions of its capital markets. Second, most of the listed companies on these exchanges are well-known leading enterprises in China, representing typical industries and sector leaders; thus, their data are highly representative. By analyzing these data, one can gain insights into the operational status of Chinese enterprises, which can, in turn, guide investment decisions. Third, in the context of globalization, the market position of Chinese enterprises is becoming increasingly significant, with several large A-share companies emerging as formidable competitors in international markets. Therefore, analyzing data from A-share companies also helps illustrate the international competitiveness and future development trends of Chinese

enterprises, which is useful for understanding global ESG dynamics and trends in capital markets. In summary, the selection of Shanghai and Shenzhen A-share company data is justified by its representativeness of the overall situation of Chinese enterprises, allowing for a better understanding of their current development status and future trajectory, which is beneficial for guiding investment decisions and market predictions. The chosen time frame is due to the enactment of the "Opinions of the State Council on Strengthening Assurance Work" in 2014, which emphasized the role of assurances in promoting improvements in people's livelihoods and ecological civilizations. Prior to this, the proportion of companies voluntarily conducting ESG assurances was extremely low. Information related to ESG assurances for 2023 will be gradually released in 2024, and comprehensive data for 2023 are not yet available. Thus, the selected timeframe for this study is 2014–2022. Data were collected using Python (3.10) to capture information on corporate ESG reports and related data. The primary data sources include the Cninfo website, CSMAR, RESSET databases, and the official websites of listed companies. Samples classified as ST, *ST, PT, and those with missing data were excluded, resulting in 14,376 observations across 78 industries subjected to two-tailed 1% winsorization. Data processing was conducted using Excel (2408) and Stata (18.0).

3.3. Variable Definition

3.3.1. Dependent Variable

Greenwashing is a behavior of embellishing corporate ESG performance through impression management strategies. According to Walker and Wan's (2012) research [46], this paper defines corporate greenwashing strategy as two methods: selective disclosure and descriptive manipulation. The former refers to selectively reporting ESG issues, that is, "reporting good news but not bad news". If a company has done nothing in a certain ESG issue that should be disclosed, such as not taking any effective measures in environmental technology research and process innovation, it chooses to keep silent. The latter refers to beautifying the company's image through strategic expressions, that is, "talking too much but not doing enough" or "inconsistent words and deeds", shouting loud slogans, but in reality, it is difficult to verify the authenticity of corporate ESG actions.

On the basis of the previous analysis, Model (12) is constructed to measure the corporate greenwashing behavior degree as dependent variable (Greenw), based on Huang et al.'s (2019) research [47].

$$\text{Corporate greenwashing behavior degree} = \sqrt{\text{Selective disclosure} \times \text{descriptive manipulation}} \quad (12)$$

To measure selective disclosure, we have summarized the items that should be disclosed in an ideal model of corporate ESG related issues in accordance with relevant laws, regulations, standards, and guidelines. However, in practice, companies may have commitments or performance in some areas while lacking commitments or performance in others. Selective disclosure refers to companies choosing to disclose only certain ESG-related items, thereby avoiding more critical issues, essentially resulting in undisclosed items that should have been reported. We measure the extent of selective disclosure by the ratio of undisclosed items to the total number of items that should be disclosed, as detailed in Model (13).

$$\text{Selective disclosure} = 100 \times (1 - \text{disclosed matters}/\text{total matters to be disclosed}) \quad (13)$$

Descriptive manipulation refers to the proportion of strategic embellishments made by companies regarding ESG-related activities in disclosed matters, quantified as the ratio of symbolic disclosure matters to total disclosed matters, as detailed in Model (14).

$$\text{Descriptive manipulation} = 100 \times (\text{symbolic disclosure matters}/\text{disclosed matters}) \quad (14)$$

Symbolic disclosure refers to information presented in qualitative statements, copied from previous annual statements, or data that are easily imitated, of low reliability, and

difficult to verify, such as "the company has conducted environmental protection treatment on the pollution gas emission systems, achieving good environmental and social benefits". In contrast, substantive disclosure refers to information presented in quantitative statements and case illustrations, which are not easily replicable and are thus deemed more reliable. For example, "the Shanxi branch undertook technological modifications to boiler No. ##, investing 14.3 million yuan, resulting in a reduction of 15.21 tons of waste emissions per year and environmental benefits valued at 2.13 million yuan annually".

This research constructs the indicator system for measuring corporate greenwashing behavior. The details are shown in Table 3.

Table 3. Indicator system for measuring corporate greenwashing behavior.

Category	Indicator
Governance and institutions	Environmental policy and strategy
	Environmental protection goals and achievements
	Environmental regulations and enforcement
	Environmental management institutions and operations
Processes and controls	Environmental certification systems and implementation
	Environmental honors and recognition
	Environmental investment and comprehensive remediation plans
	Environmental education training and public welfare activities
	Environmental technology research and process innovation
Inputs and outputs	Energy consumption and reduction measures
	Water resource consumption and reduction measures
	Greenhouse gas emissions and reduction measures
	Waste gas emissions and reduction measures
	Wastewater production and reduction measures
	Solid waste generation and treatment measures
	Other emission reduction measures, such as greening, noise control, and logistics
Compliance and regulation	Statements on compliance with environmental laws and regulations
	Risk assessment related to environmental policies
	Description of industry characteristics on environmental impacts
	Statements regarding significant environmental pollution incidents

This research constructs 20 indicators across four dimensions: governance and institutions, processes and controls, inputs and outputs, and compliance and regulation, following the methodology of Simpson et al. (2022) [43]. These indicators include environmental policies and strategies, environmental certification systems and their implementation, energy consumption and reduction measures, and compliance with environmental laws and regulations. In this study, text analysis is used to score the ESG related issues publicly disclosed by company from the aspects of symbolic and substantive disclosures. We assigned a value of 1 to "yes" and 0 to "no".

3.3.2. Independent Variables

The signal transmission theory suggests that third-party assurance can distinguish between "greenwashing" and "true green" companies, which helps to suppress corporate greenwashing behavior [48]. To measure ESG report assurance as an independent variable (Ass), ESG reports are scraped via Python 3.10. If the ESG assurance report is present, Ass equals 1. If the ESG report is unassured or the ESG assurance report is absent, Ass equals 0.

According to Meigs et al. (1992), independence is a crucial factor ensuring the effective functioning of modern assurance in its expanding role [49]. Reference [50] identified a phenomenon where assurance opinions are often "captured" by companies in non-financial reporting assurance. In this context, companies include assurance entities in their interest groups to transfer benefits, thereby compromising their entities' independence and aligning more closely with management consultancy practices. In such cases, ESG as-

surance becomes ineffectual, serving merely as a means for companies to embellish their performance and enhance their reputations, which lacks informational value. However, the independence statement is not currently mandatory. Thus, To measure independence of ESG assurance as an independent variable (Ass_q), ESG report details were recovered using Python 3.10. If the ESG assurance report contains a statement of independence, as indicated by relevant wording such as "we comply with the independence and other ethical requirements set out in the Code of Ethics for Professional Accountants issued by the International Ethics Standards Board for Accountants", then Ass_q equals 1; otherwise, it equals 0. Notably, China currently lacks standards for ESG assurance reports, and the requirements for independence in ESG assurance are not strictly enforced. Issuing a statement of independence implies higher assurance costs. Consequently, some ESG assurance entities may issue reports lacking statements of independence owing to nonstandard reporting formats or to avoid incurring high assurance costs.

3.3.3. Moderating Variables

The institutional environment has a restraining effect on companies adopting "greenwashing" strategy to obtain internal and external support [51]. Drawing on methods from Allen et al. (2005) [52], indicators from the "Market Intermediary Organization Development and Legal Environment—Maintaining a Legal Environment for the Market" are adopted to measure legal environment as a moderating variable (Law) in this study, as reported by Wang et al. (2021) for marketisation indices across provinces in China [53].

Management shareholding can reduce agency conflicts, align managers' interests with those of shareholders, encourage thorough operational decision-making, and prompt management to fulfil ESG responsibilities diligently, consequently diminishing the probability of greenwashing behavior. To measure management shareholding as a moderating variable (Msh), we have investigated whether the management holds shares in the company. If management does hold shares, Msh equals 1; otherwise, it equals 0.

3.3.4. Mediating Variable

ESG assurance can effectively play the role of authentication, information transmission, and risk mitigation, facilitate genuine improvements in corporate ESG performance, and thus avoid greenwashing behavior. This study follows the research methodology of Yang et al. (2023) [54] and employs China's Huazheng ESG evaluation index to measure corporate ESG performance as a mediating variable (Perf_esg). This scoring standard has been widely recognized in both domestic and international academic circles. Additionally, to ensure robustness, the Bloomberg evaluation index is adopted based on Yu et al.'s (2024) methodology [55] to effectively mitigate issues of data loss and truncation, thus accurately reflecting data changes and yielding more robust results.

3.3.5. Control Variables

This study draws on the research of Bermane (2001) [56], using the controlled variables that influence corporate greenwashing governance in the model. Related variables are detailed in Table 4.

Table 4. Variable definition table.

Category	Variable Name	Abbreviation	Definition
Dependent variable	Corporate greenwashing behavior	Greenw	See the detailed description in Section 3.3, Variable Definition.
Independent variable	ESG report assurance	Ass	If ESG report is assured. it takes 1, otherwise takes 0.
	Independence of ESG assurance	Ass_q	If the ESG assurance report contains an independence statement, it takes 1, otherwise takes 0.

Table 4. *Cont.*

Category	Variable Name	Abbreviation	Definition
Moderating variable	Legal environment	Law	"China Province Market Index Report", "the development of market intermediary organizations and the legal environment—maintain the legal environment of the market" index
	Management Shareholding	Msh	If the manager holds equity in the company, it takes 1, otherwise takes 0.
Mediating Variable	Corporate ESG Performance	Perf_esg	China's Huazheng ESG evaluation index
Controlled variable	Leverage ratio	Lev	Total liabilities divided by total assets
	Growth rate	Growth	(Sales revenue of the current year − sales revenue of the previous year)/sales revenue of the previous year
	Company size	Size	Ln (total assets at the end of the accounting period)
	Company age	Age	Ln (year of listing − statistical year + 1)
	Capital expenditure	Capexp	Long-term assets cash flow
	Total asset turnover	Tat	Operating revenue divided by total assets
	Net asset per share	Naps	Shareholders' equity divided by common stocks
	Net cash flow per share	Ncfps	Net operating cash flow divided by total assets
	Return on assets	Roa	Net profit divided by the average balance of total assets.
	Tobin's Q	Tq	Market value divided by total assets
	Equity concentration	Top10	The shareholding ratio of top ten shareholders
	Dual roles	Dua	Dual title of chairman and CEO. If chairman and CEO are held by the same person, it takes 1, otherwise takes 0.
	Board regulation	Board	The total number of directors on the board
	Supervisory board size	Svs	The total number of supervisors on the supervisory board
	Committee supervision and governance	Wcbii	The total number of committees
	Audit opinion	Audo	It takes 1 for the standard opinion, otherwise takes 0.
	Corporate risk	Risk	Comprehensive leverage
	Property rights	Soe	It takes 1 for State-owned, otherwise takes 0.
	Industry	Industry	Industry virtual variables
	Year	Year	Vintage virtual variable

The leverage ratio (Lev) reflects the level of debt risk to the company. The growth rate (Growth) indicates developmental capacity. The company size (Size) represents scale effects. The company age (Age) provides insight into the fundamentals of companies. Capital expenditure (Capexp) represents the funding allocated for long-term projects, reflecting financial adequacy and the ability to seize investment and development opportunities. Total asset turnover (Tat) reflects the efficiency and capability of asset operations. Net asset per share (Naps) reflects the degree of capital constraints from a shareholder's perspective. Net cash flow per share (Ncfps) suggests increased cash flow availability. Return on assets (Roa) indicates profitability and risk resilience. Tobin's Q (Tq) reflects stock market value and development potential of companies. Equity concentration (Top10) reflects agency costs. Dual roles (Dua) indicate managerial power. Board regulation (Board) reflects the level of board oversight, positively correlating with its effectiveness. Supervisory board size (Svs) reflects the level of supervision to board of directors and managers. The supervisory board has an indirect impact on greenwashing, while not being directly involved in operations. The variable committee supervision and governance (Wcbii) reflects supervisory and governance effects in professional fields, which helps to fairly and objectively evaluate

enterprises. Audit opinion (Audo) on financial statements reflects the results of external supervision and the level of recognition. Corporate risk (Risk) reflects crisis and crisis resolution capabilities and has a certain impact on the survival of enterprises. Property rights (Soe) control the impact of differences in property rights. Industry and year control industry and year differences.

3.4. Model Construction

To examine the governance effect of ESG assurance on corporate greenwashing behavior, this study builds Model (15) based on the methodology of Lyon and Montgomery (2013) [57] to test Hypothesis H1.

$$\text{Greenwi, t} = \alpha 0 + \alpha 1\text{Assi, t(Ass\_qi.t)} + \Sigma\alpha n\text{Cvsi, t} + \Sigma\text{Industry} + \Sigma\text{Year} + \varepsilon\text{i, t} \quad (15)$$

To test H2, which concerns the governance effect of ESG assurance and the legal environment on corporate greenwashing, we introduce the interaction term between ESG assurance and the legal environment (Law) into Model (15), forming Model (16), and anticipate that the interaction term coefficient will be significantly positive.

$$\begin{aligned}\text{Greenwi, t} &= \beta 0 + \beta 1\text{Assi, t(Ass\_qi, t)} + \beta 2\text{Assi, t(Ass\_qi, t)} \times \text{Lawi, t} + \beta 3\text{Lawi, t} + \Sigma\beta n\text{Cvsi, t} + \Sigma\text{Industry} + \\ &\Sigma\text{Year} + \varepsilon\text{i, t}\end{aligned} \quad (16)$$

To verify H3, relating to the governance effect of ESG assurance and managerial shareholding on corporate greenwashing, we introduce the interaction term between ESG assurance and managerial shareholding (Msh) into Model (15), forming Model (17), with the expectation that the interaction term coefficient will also be significantly positive.

$$\begin{aligned}\text{Greenwi, t} &= \gamma 0 + \gamma 1\text{Assi, t(Ass\_qi, t)} + \gamma 2\text{Assi, t(Ass\_qi, t)} \times \text{Mshi, t} + \gamma 3\text{Mshi, t} + \Sigma\gamma n\text{Cvsi, t} + \Sigma\text{Industry} + \\ &\Sigma\text{Year} + \varepsilon\text{i, t}\end{aligned} \quad (17)$$

To assess the partial mediating effect of corporate ESG performance between ESG assurance and the governance of greenwashing behavior, this study constructs models (15), (18), and (19) following the approaches of Wen and Ye (2014) and Zhang et al. (2018) [58,59].

$$\text{Perf\_esgi, t} = \delta 0 + \delta 1\text{Assi, t(Ass\_qi, t)} + \Sigma\delta n\text{Cvsi, t} + \Sigma\text{Industry} + \Sigma\text{Year} + \varepsilon\text{i, t} \quad (18)$$

$$\text{Greenwi, t} = \lambda 0 + \lambda 1\text{Assi, t(Ass\_qi, t)} + \lambda 2\text{Perf\_esgi, t} + \Sigma\lambda n\text{Cvsi, t} + \Sigma\text{Industry} + \Sigma\text{Year} + \varepsilon\text{i, t} \quad (19)$$

4. Empirical Research

4.1. Descriptive Statistics and Subsample Comparative Analysis

This paper conducts descriptive statistics and subsample comparative analysis. The results are presented in Table 5.

Table 5. Descriptive statistics and subsample comparative analysis test results.

Panel A: Full Sample								
Variable	**Mean**	**Sd**	**Min**	**P25**	**P50**	**P75**	**Max**	**N**
Greenw	50.2696	18.4865	0.0000	38.2360	49.0647	62.2543	96.5573	14,376
Ass	0.0314	0.1743	0.0000	0.0000	0.0000	0.0000	1.0000	14,376
Ass qdli	0.0244	0.1543	0.0000	0.0000	0.0000	0.0000	1.0000	13,986
Law	7.3716	2.0247	−0.0050	6.2912	7.4425	8.8100	12.8700	14,376
Msh	10.9755	17.9669	0.0000	0.0004	0.2229	13.7186	100.0000	14,376
Lev	0.4664	0.5763	0.0091	0.2865	0.4518	0.6228	63.9712	14,376
Growth	0.0047	0.1633	−0.0100	−0.0003	0.0009	0.0025	18.7837	14,376
Size	22.8046	1.7682	14.9416	21.5929	22.5039	23.7342	31.3101	14,376
Age	2.2499	0.8754	0.0000	1.7918	2.4849	2.9444	3.4965	14,376
Capexp	18.9722	2.1215	0.0000	17.8031	18.9599	20.2210	26.5125	14,376

Table 5. *Cont.*

Panel A: Full Sample								
Variable	**Mean**	**Sd**	**Min**	**P25**	**P50**	**P75**	**Max**	**N**
Tat	0.5827	0.5168	0.0004	0.2938	0.4841	0.7262	11.4156	14,376
Naps	5.8721	4.4958	0.2882	3.0795	4.6940	7.1458	27.7184	14,376
Ncfps	0.2550	1.0860	−2.7513	−0.1773	0.0691	0.4594	5.4459	14,376
Roa	0.0416	0.1651	−16.1124	0.0135	0.0368	0.07090	7.2493	14,376
Tq	2.2338	1.5947	0.8289	1.2196	1.7447	2.5547	10.3143	14,376
Top10	60.2539	16.8270	1.3200	48.2450	60.5350	71.9400	100.0000	14,376
Dua	0.2467	0.4311	0.0000	0.0000	0.0000	0.0000	1.0000	14,376
Board	8.8153	1.9518	0.0000	7.0000	9.0000	9.0000	19.0000	14,376
Svs	3.7462	1.3617	0.0000	3.0000	3.0000	5.0000	15.0000	14,376
Wcbii	4.0403	0.5903	0.0000	4.0000	4.0000	4.0000	8.0000	14,376
Audo	0.9694	0.1723	0.0000	1.0000	1.0000	1.0000	1.0000	14,376
Risk	0.0312	0.5294	−0.0162	0.0123	0.0163	0.0264	62.7005	14,376
Soe	0.4341	0.4956	0.0000	0.0000	0.0000	1.0000	1.0000	14,376
Panel B: Ass Group								
Variable		**Mean Test**		**T Test**		**Median Test**		**Z Test**
Greenw	45.9151	50.4106	−4.4955	−5.0871 ***	45.8759	49.2042	−3.3283	−4.6574 ***
Panel C: Ass_q Group								
Variable		**Mean Test**		**T Test**		**Median Test**		**Z Test**
Greenw	47.6764	50.3345	−2.6581	−2.6613 ***	47.1103	49.0647	−1.9544	−1.9906 **

Note: *** and ** indicate significance at the 1% and 5% levels, respectively. Panel B and Panel C respectively report the results of the subsample comparative analysis for Ass and Ass_q.

In Panel A of Table 5, corporate greenwashing behavior (Greenw) ranges from 0.0000 to 96.5573, with a mean of 50.2696 and a standard deviation of 18.4865, indicating a pressing need for the governance of corporate greenwashing. The ESG report assurance (Ass) ranges from 0.0000 to 1.0000, with a mean of 0.0314 and a standard deviation of 0.1743, revealing that only 3.14% of sample companies opted for third-party assurance of their ESG reports and disclosed assurance reports during the period from 2014 to 2022. The independence of ESG assurance (Ass_q) ranges from 0.0000 to 1.0000, with a mean of 0.0244 and a standard deviation of 0.1543, suggesting that only 2.44% of the sample companies had ESG assurance reports with third-party independence assurance during the same period. The proportions of assured ESG (Ass) and independent ESG assurance (Ass_q) are relatively low. This is because, unlike the mandatory audit system for financial reports, China has yet to implement a compulsory ESG assurance system. Companies are required to pay certain fees to engage ESG assurance entities, or they may be motivated to engage in "greenwashing", leading to a low proportion of assurance ESG reports. Currently, there is a lack of standards for ESG assurance reports in China, and the disclosure requirements regarding the independence of ESG assurance are not stringent. The issuance of an independence statement implies a greater investment in assurance costs. Consequently, some ESG assurance entities may issue ESG assurance reports lacking independence statements owing to nonstandard reporting formats or to avoid incurring high assurance costs. At present, companies' greenwashing behavior has become increasingly covert and technical. ESG reports and financial reports constitute components of a company's information system, collectively reflecting the economic responsibilities entrusted to management. The disclosure of ESG information, together with financial report disclosures, jointly influences the decision-making and choices of all stakeholders. ESG assurance is as important as financial report auditing is, necessitating a guarantee of the quality of disclosed information. There is an urgent need to enhance the scope and strength of ESG assurance governance. This is the impetus behind this study. More importantly, ESG assurance provides a basis and underlying logic for other external governance mechanisms (such as those from regulatory agencies, media,

stakeholders, and the public). Other external governance mechanisms often require reliable and objective information obtained from assurance sources to understand the company sufficiently, thereby playing a governance role that collectively mitigates "greenwashing" practices. This study explores the governance effect and mechanism of ESG assurance on corporate greenwashing behavior, in order to promote the expansion of ESG assurance and the improvement of related norms and regulations. Detailed descriptive statistics for the controlled variables can be found in Table 5.

Panels B and C of Table 5 report the results of the subsample comparative analysis. In the groups with ESG report assurance and ESG assurance reports that include independence statements, the explained variable of corporate greenwashing behavior (Greenw) has both a higher mean and median than do the groups without assurance or lacking independence statements in the ESG assurance reports, which passed the comparative analysis tests, providing preliminary support for Hypothesis H1.

4.2. Regression Results and Analysis

4.2.1. ESG Assurance and Governance of Corporate Greenwashing

The regression results for ESG assurance and governance of corporate greenwashing are shown in Table 6.

The regression coefficient for the explanatory variable ESG assurance (Ass) is −3.5552, which is significant at the 1% level. This finding indicates that companies with assured ESG reports have a lower probability of engaging in greenwashing, suggesting that ESG assurance effectively suppresses corporate greenwashing behavior. The regression coefficient for the explanatory variable ESG assurance independence (Ass_q) is −3.7637, which is significant at the 1% level. This finding indicates that companies with independent ESG assurance exhibit a reduced likelihood of greenwashing. This is attributable to fraud triangle theory, where pressure, opportunity, and rationalization are the primary causes of corporate fraud. ESG assurance can effectively communicate compliance with ESG behaviors to stakeholders, alleviating the environmental pressures faced by companies and reducing the opportunities for greenwashing caused by information asymmetry and regulatory deficiencies. Furthermore, they can convey misleading messages of moral rationalization regarding greenwashing behaviors—such as excuses for unethical practices—which create a deterrent effect, thereby effectively inhibiting greenwashing tendencies. Hypothesis H1 is validated.

The results from grouping by property nature indicate that for state-owned enterprises, the regression coefficient for ESG report assurance (Ass) is −1.4808, with statistical tests showing no significance. However, for non-state-owned enterprises, the coefficient for ESG report assurance (Ass) is −5.1602, which is significant at the 1% level, with an intergroup difference test coefficient of 3.7700, which is significant at the 10% level. For state-owned enterprises, the regression coefficient for ESG assurance independence (Ass_q) is 0.8432, which is also not statistically significant, whereas for non-state-owned enterprises, the regression coefficient for ESG assurance independence (Ass_q) is −6.0796, which is significant at the 1% level, and the intergroup difference test coefficient is 9.9500, which is significant at the 1% level. This finding indicates that ESG assurance plays a more active role in non-state-owned enterprises, significantly suppressing their greenwashing behaviors. This occurs because, on the one hand, state-owned enterprises typically possess low risk and robust stability characteristics. When such enterprises encounter difficulties, their state ownership often leads to government bailouts, resulting in soft budget constraints. The government provides implicit guarantees to state-owned enterprises, alleviating operational pressures and decreasing the motivations and probabilities of greenwashing related to information asymmetry. On the other hand, while non-state-owned enterprises are a crucial driving force in the national economy, they lack such governmental support and robust policy support. Consequently, their survival and growth heavily rely on enhancing their own competitiveness [60], often opting to invest in projects with higher ESG risks and returns to maximize corporate value. Compared with state-owned enterprises, non-

state-owned enterprises face greater risks and operational pressures, making them more inclined to cultivate a positive image with stakeholders and maintain their reputation to garner broader support, thus exhibiting stronger motivations for engaging in greenwashing. Therefore, the role of ESG assurance in governing their greenwashing behaviors is significantly more pronounced.

Table 6. Regression results for ESG assurance and governance of corporate greenwashing.

Variable	Greenw Full Sample (1)	Greenw Full Sample (2)	Greenw State-Owned Enterprises (3)	Greenw Non-State-Owned Enterprises(4)	Greenw State-Owned Enterprises (5)	Greenw Non-State-Owned Enterprises(6)
Ass	−3.5552 ***		−1.4808	−5.1602 ***		
	(0.0000)		(0.2293)	(0.0008)		
Ass_q		−3.7637 ***			0.8432	−6.0796 ***
		(0.0000)			(0.5431)	(0.0005)
Lev	−0.2755	−0.2779	4.3357 ***	−1.1124	4.5263 ***	−1.1137
	(0.2448)	(0.2420)	(0.0033)	(0.1024)	(0.0021)	(0.1019)
Growth	0.6554	0.6616*	0.8577	4.1521	0.8886	4.1716
	(0.1007)	(0.0979)	(0.3982)	(0.1910)	(0.3815)	(0.1889)
Size	−1.4443 ***	−1.4608 ***	0.9807 ***	3.4150 ***	0.8534 ***	3.4096 ***
	(0.0000)	(0.0000)	(0.0006)	(0.0000)	(0.0030)	(0.0000)
Age	0.9341 ***	0.9389 ***	−2.7640 ***	−0.8016 ***	−2.7614 ***	−0.8088 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0021)	(0.0000)	(0.0019)
Capexp	−0.3615 ***	−0.3635 ***	−2.7198 ***	−3.1893 ***	−2.7152 ***	−3.1925 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Tat	−0.6304 ***	−0.6466 ***	−2.3241 ***	−2.2415 ***	−2.3237 ***	−2.2767 ***
	(0.0055)	(0.0045)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Naps	0.1740 ***	0.1735 ***	0.1543 **	0.0569	0.1615 **	0.0551
	(0.0000)	(0.0000)	(0.0144)	(0.2620)	(0.0104)	(0.2771)
Ncfps	−0.0713	−0.0695	0.1060	−0.2085	0.1181	−0.2081
	(0.5228)	(0.5332)	(0.6605)	(0.2365)	(0.6248)	(0.2373)
Roa	−0.6008	−0.6066	1.9435	−4.9243 *	1.9831	−4.9269 *
	(0.5020)	(0.4993)	(0.4061)	(0.0557)	(0.3966)	(0.0556)
Tq	−0.3378 ***	−0.3393 ***	0.2519	0.2916 **	0.2156	0.2926 **
	(0.0000)	(0.0000)	(0.2542)	(0.0171)	(0.3295)	(0.0168)
Top10	−0.0324 ***	−0.0323 ***	−0.0590 ***	−0.0298**	−0.0593 ***	−0.0299 **
	(0.0001)	(0.0001)	(0.0005)	(0.0160)	(0.0005)	(0.0156)
Dua	0.7599 ***	0.7617 ***	0.0896	2.0641 ***	0.1063	2.0654 ***
	(0.0028)	(0.0027)	(0.9104)	(0.0000)	(0.8938)	(0.0000)
Board	−0.2488 ***	−0.2540 ***	−0.0382	−0.2944 **	−0.0372	−0.2948 **
	(0.0003)	(0.0002)	(0.7772)	(0.0156)	(0.7833)	(0.0154)
Svs	−0.1448	−0.1521	−0.1560	0.1297	−0.1809	0.1404
	(0.2349)	(0.2122)	(0.3825)	(0.5643)	(0.3111)	(0.5324)
Wcbii	−1.0392 ***	−1.0434 ***	0.9712 **	−1.1280 ***	0.8874 **	−1.1278 ***
	(0.0000)	(0.0000)	(0.0189)	(0.0040)	(0.0325)	(0.0040)
Audo	0.4506	0.4562	6.9644 ***	3.1942 ***	7.0022 ***	3.2108 ***
	(0.4644)	(0.4591)	(0.0001)	(0.0019)	(0.0000)	(0.0018)
Risk	−0.1066*	−0.1067*	−0.4230	−5.5062 **	−0.4232	−5.5038 **
	(0.0877)	(0.0862)	(0.1622)	(0.0365)	(0.1620)	(0.0365)
Soe	0.4625	0.4747	-	-	-	-
	(0.1285)	(0.1187)	-	-	-	-
_Cons	109.2497 ***	109.7275 ***	78.4508 ***	41.2450 ***	81.5715 ***	41.4139 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Industry and Year	Yes	Yes	Yes	Yes	Yes	Yes
N	14,376	14,376	6240	8136	6240	8136
Adj R^2	0.5003	0.5002	0.0805	0.0828	0.0804	0.0829
Suest	-	-	3.7700 *		9.9500 ***	

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Values in parentheses are P statistics.

4.2.2. ESG Assurance, the Legal Environment, and the Governance of Corporate Greenwashing Behavior

The regression results for ESG assurance, legal environment, and the governance of corporate greenwashing behavior are presented in Table 7.

Table 7. Regression results for ESG assurance, legal environment (management shareholding), and governance of corporate greenwashing.

Panel A: Take Ass as the Independent Variable				
Variable	**(1)**	**(2)**	**(3)**	**(4)**
Ass	−3.5445 ***	−9.4443 ***	−3.5096 ***	−4.2867 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Law	−0.1378 **	−0.1458 **		
	(0.0240)	(0.0191)		
Ass × Law		0.7419 ***		
		(0.0084)		
Msh			−0.0239 ***	−0.0239 ***
			(0.0002)	(0.0002)
Ass × Msh				0.3434 **
				(0.0219)
Controls	Yes	Yes	Yes	Yes
_Cons	109.3027 ***	109.2310 ***	111.0817 ***	110.8418 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Industry and Year	Yes	Yes	Yes	Yes
N	14,376	14,376	14,376	14,376
Adj R^2	0.4993	0.4994	0.5006	0.5000
Panel B: Take Ass_ q as the Independent Variable				
Variable	**(1)**	**(2)**	**(3)**	**(4)**
Ass_q	−3.8106 ***	−9.3133 ***	−3.7083 ***	−4.0912 ***
	(0.0000)	(0.0007)	(0.0000)	(0.0000)
Law	−0.1402 **	−0.1547 **		
	(0.0219)	(0.0128)		
Ass_q × Law		0.8072 ***		
		(0.0091)		
Msh			−0.0239 ***	−0.0239 ***
			(0.0002)	(0.0002)
Ass_q × Msh				0.2402 **
				(0.0401)
Controls	Yes	Yes	Yes	Yes
_Cons	109.7555 ***	110.0955 ***	111.5583 ***	111.4886 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Industry and Year	Yes	Yes	Yes	Yes
N	14,376	14,376	14,376	14,376
Adj R^2	0.4992	0.4994	0.5005	0.4995

Note: *** and ** indicate significance at the 1% and 5% levels, respectively. Values in parentheses are P statistics.

In Panel A, the regression coefficient of ESG report assurance (Ass) on corporate greenwashing behavior (Greenw) in column (1) is −3.5445, which is significant at the 1% level, whereas the regression coefficient of the legal environment (Law) on corporate greenwashing behavior (Greenw) is −0.1378, which is significant at the 5% level. This finding indicates that both ESG report assurance and the legal environment effectively suppress corporate greenwashing behavior, meaning that external assurance governance and legal oversight serve as effective constraints on corporate conduct. In column (2), the interaction term between the legal environment (Law) and ESG report assurance (Ass) has a coefficient of 0.7419, which is significant at the 1% level, suggesting a certain degree of substitutive effect between ESG report assurance and the legal environment in the governance of corpo-

rate greenwashing behavior. Specifically, this implies that when the legal environment is relatively weak, ESG report assurance is more likely to play a significant role, effectively curbing corporate greenwashing behavior. In Panel B, the regression coefficient of ESG assurance independence (Ass_q) on corporate greenwashing behavior (Greenw) in column (1) is −3.8106, which is significant at the 1% level, with the regression coefficient of the legal environment (Law) on corporate greenwashing behavior (Greenw) being −0.1402, which is significant at the 5% level. This again demonstrates that both ESG assurance independence and the legal environment can effectively restrain corporate greenwashing behavior. The interaction term in column (2) between the legal environment (Law) and ESG assurance independence (Ass_q) has a coefficient of 0.8072, which is significant at the 1% level, indicating a certain substitutive effect on the governance of corporate greenwashing behavior. This suggests that in a weaker legal environment, the independence of ESG assurance is more impactful, thereby effectively suppressing corporate greenwashing behavior. This is because both assurance supervision and legal regulation serve as avenues for managing corporate greenwashing behaviors, each demonstrating effective governance. In an environment with relatively weak legal frameworks, effective ESG assurance can increase the "cost of deception" for greenwashing companies, enhancing information transparency and the risks of exposure, thus significantly suppressing greenwashing behaviors. Hypothesis H2 is validated.

4.2.3. ESG Assurance, Management Shareholding, and Governance of Corporate Greenwashing Behavior

The regression results concerning ESG assurance, management shareholding, and the governance of corporate greenwashing behavior are also presented in Table 7. In Panel A, the regression coefficient of ESG report assurance (Ass) on corporate greenwashing behavior (Greenw) in column (3) is −3.5096, which is significant at the 1% level, and the regression coefficient of management shareholding (Msh) on corporate greenwashing behavior (Greenw) is −0.0239, which is also significant at the 1% level. This reveals that both ESG report assurance and management shareholding contribute to the suppression of corporate greenwashing behavior, indicating that both external assurance governance and internal governance effectively constrain corporate conduct. In column (4), the interaction term of management shareholding (Msh) with ESG report assurance (Ass) has a coefficient of 0.3434, which is significant at the 5% level, suggesting that an increase in management shareholding diminishes the suppressive effect of ESG report assurance on corporate greenwashing behavior, indicating a certain degree of substitutive effect between ESG report assurance and management shareholding in the governance of corporate greenwashing behavior. In Panel B, the regression coefficient of ESG assurance independence (Ass_q) on corporate greenwashing behavior (Greenw) in column (3) is −3.7083, which is significant at the 1% level; the regression coefficient of management shareholding (Msh) on corporate greenwashing behavior (Greenw) remains −0.0239, which is significant at the 1% level. This further affirms that both ESG assurance independence and management shareholding help curb corporate greenwashing behavior. In column (4), the interaction term of management shareholding (Msh) with ESG assurance independence (Ass_q) has a coefficient of 0.2402, which is significant at the 5% level, suggesting that an increase in management shareholding reduces the suppressive effect of ESG assurance independence on corporate greenwashing behavior. This implies a certain substitutive effect between ESG assurance independence and management shareholding in governing corporate greenwashing behavior. This is due to agency theory, wherein management ownership fosters incentive and supervisory effects that can efficiently mitigate agency problems. Once management holds shares, their goals become aligned with those of stakeholders, motivating them to control company risk and enhance governance standards, triggering a cascade of reactions that fortify internal control mechanisms. In the absence of mandatory ESG assurance, management ownership thus plays a crucial substitute role. Hypothesis H3a is validated.

5. ESG Assurance, Corporate ESG Performance, and the Governance of Greenwashing Behaviors

To achieve the research objective of analyzing the intrinsic influence mechanisms of ESG assurance on corporate greenwashing behaviors from the perspective of corporate ESG performance, this study further examines the inherent relationships among ESG assurance, corporate ESG performance, and the governance of corporate greenwashing behaviors. China's economy has transitioned from a phase of rapid growth to one of high-quality development. The fulfilment of corporate social responsibility is inextricably linked to the principles of equitable, safe, and shared high-quality development, necessitating that corporate decision-making considers the collective interests of stakeholders such as shareholders, employees, customers, and the community [61,62]. García-Sánchez et al. (2019) assert that the disclosure of corporate sustainability reports and the quality of assurance significantly influence financing channels and that sustainability ratings regarding corporate ESG performance can deter "greenwashing" behavior [63].

First, acting as an authentication mechanism, ESG assurance serves as an effective governance tool capable of supervising and evaluating the fairness, legality, and efficacy of a company's compliance with environmental protection and social responsibility under the constraints of the "dual carbon" targets. This promotes green development and encourages companies to genuinely prioritize ecological concerns, increase their level of social responsibility, and improve governance, thereby playing a crucial role in the governance of greenwashing behavior. Second, owing to its information transmission function, ESG assurance can alleviate issues of information asymmetry and adverse selection in capital markets, thereby enhancing market efficiency. More importantly, ESG assurance provides a basis for other external governance mechanisms, which often need reliable, objective information, authenticated through assurance, to gain an understanding of the company, thus fostering collaborative governance efforts aimed at improving corporate ESG performance [64]. In this way, companies free of "greenwashing" or "green-dyeing" behavior stand out, incentivizing them to self-regulate against greenwashing. Third, the risk mitigation mechanism of ESG assurance enhances stakeholders' confidence in ESG risk factors. ESG assurance entities assume certain risks to maintain their reputations, facilitate genuine improvements in corporate ESG performance, and stabilize investor sentiment and contractual relationships, thereby promoting the governance of greenwashing behavior.

Table 8 reports the regression results for Models (18) and (19), while the results for Model (15) are displayed in Table 6.

Table 8. Regression results for ESG assurance, corporate ESG performance, and governance of corporate greenwashing.

Variable	Perf_esg (1)	Greenw (2)	Perf_esg (3)	Greenw (4)
Ass	0.1872 ***	−3.3955 ***		
	(0.0007)	(0.0000)		
Ass_q			0.1538 **	−3.6317 ***
			(0.0139)	(0.0000)
Perf_esg		−0.8530 ***		−0.8581 ***
		(0.0000)		(0.0000)
Controls	Yes	Yes	Yes	Yes
_Cons	0.2889	109.4962 ***	0.2375	109.9313 ***
	(0.2578)	(0.0000)	(0.3502)	(0.0000)
Industry and Year	Yes	Yes	Yes	Yes
N	14,376	14,376	14,376	14,376
Adj R^2	0.2492	0.5023	0.2489	0.5022

Note: *** and ** indicate significance at the 1% and 5% levels, respectively. Values in parentheses are P statistics.

The regression coefficient for ESG report assurance (Ass) in column (1) of Table 6 is −3.5552, which is significant at the 1% level, indicating that ESG report assurance suppresses greenwashing behavior. Column (1) of Table 8 shows that the regression coefficient for ESG report assurance (Ass) is 0.1872, which is significant at the 1% level, suggesting that, after controlling for relevant factors, ESG report assurance significantly enhances corporate ESG performance. The regression coefficient for ESG report assurance (Ass) in column (2) of Table 8 is −3.3955, which is also significant at the 1% level, whereas the ESG performance (Perf_esg) regression coefficient is −0.8530, which is significant at the 1% level. This finding indicates that a partial mediating effect exists between ESG report assurance and the governance of greenwashing behavior concerning corporate ESG performance when relevant factors are controlled for. Furthermore, the regression coefficient for ESG report assurance (Ass) has improved from −3.5552 in Table 6 column (1) to −3.3955 in Table 8 column (2), and both α_1 and $\delta_1\lambda_2$ are positive, demonstrating that corporate ESG performance acts as a partial mediator for the promotion of governance against greenwashing by ESG report assurance, with an effect size of 4.4915% ($\delta_1\lambda_2/\alpha_1$). In column (2) of Table 6, the regression coefficient for ESG assurance independence (Ass_q) is −3.7637, which is significant at the 1% level, indicating that the independence of ESG assurance suppresses greenwashing behavior. In column (3) of Table 5, the regression coefficient for ESG assurance independence (Ass_q) is 0.1538, which is significant at the 5% level, indicating that, after controlling for relevant factors, the independence of ESG assurance significantly promotes corporate ESG performance. Column (4) of Table 8 shows that the regression coefficient for ESG assurance independence (Ass_q) is −3.6317, which is significant at the 1% level. The regression coefficient for corporate ESG performance (Perf_esg) is −0.8581, which is also significant at the 1% level. This finding indicates that, after controlling for relevant factors, a partial mediating effect exists between corporate ESG performance and the governance of corporate greenwashing behavior through ESG assurance independence. Furthermore, the regression coefficient for ESG assurance independence (Ass_q) increases from −3.7637 in column (2) of Table 6 to −3.6317 in column (4) of Table 8. The signs of α_1 and $\delta_1\lambda_2$ are both positive, suggesting that corporate ESG performance partially mediates the effect of the independence of ESG assurance on the governance of corporate greenwashing behavior, accounting for 3.5065% of the effect ($\delta_1\lambda_2/\alpha_1$). On the basis of the above analysis, this paper's research objective of examining the intrinsic mechanisms of ESG assurance on the governance of corporate greenwashing behaviors from the perspective of corporate ESG performance has been successfully realized.

6. Endogeneity and Robustness Tests

6.1. Endogeneity Test

6.1.1. Propensity Score Matching Method

This study employs the propensity score matching (PSM) method to address issues such as sample selection bias, as shown in Table 9.

It regresses the dummy variable for ESG report assurance (Ass) against the control variables, using the logit model for variable matching. By employing iterative regression while fully considering variable importance, Lev, Size, Age, Capexp, Tat, Top10, Svs, and Wcbii are selected as covariates for Ass, which are matched on a 1:1 basis. The same approach is used for regressing the dummy variable for ESG assurance independence (Ass_q) against controlled variables, using Lev, Size, Capexp, Naps, Tq, Top10, and Wcbii as covariates for Ass_q, also matched on a 1:1 basis. After matching, $|SD| < 10.8\%$, with mean differences of 2.9% and 3.3%.

The PSM regression results are presented in Table 10.

Table 9. Balance hypothesis test results.

Panel A: Take Ass as the Treatment Variable						
Variable	**Status**	**Treated**	**Control**	**SD**	**T Value**	***p* Value**
Lev	Unmatched	0.6716	0.4598	48.2000	7.7000	0.0000
	Matched	0.6644	0.6705	−1.4000	−0.4200	0.6740
Size	Unmatched	26.4500	22.6870	182.7000	47.9100	0.0000
	Matched	26.3140	26.3150	−0.0000	−0.0000	0.9990
Age	Unmatched	2.4294	2.2441	22.0000	4.4300	0.0000
	Matched	2.4244	2.4325	−1.0000	−0.1600	0.8740
Capexp	Unmatched	21.8820	18.8780	150.5000	30.5400	0.0000
	Matched	21.8240	21.8290	−0.3000	−0.0400	0.9690
Tat	Unmatched	0.4474	0.5871	−27.9000	−5.6600	0.0000
	Matched	0.4600	0.4684	−1.7000	−0.2500	0.8000
Top10	Unmatched	72.6370	59.8530	74.8000	16.0200	0.0000
	Matched	71.9550	73.7970	−10.8000	−1.5700	0.1170
Svs	Unmatched	5.4315	3.6916	92.8000	27.3900	0.0000
	Matched	5.3735	5.4361	−3.3000	−0.3900	0.7000
Wcbii	Unmatched	4.8003	4.0157	87.8000	28.5600	0.0000
	Matched	4.7350	4.6918	4.8000	0.5900	0.5560
Variable	Status	Pseudo R^2	LR chi^2	$p > chi^2$	MeanBias	MedBias
All variables	Unmatched	0.3700	1484.3800	0.0000	85.8000	81.3000
	Matched	0.0050	5.6600	0.6850	2.9000	1.5000
Panel B: Take Ass_q as the Treatment Variable						
Variable	**Status**	**Treated**	**Control**	**SD**	**T Value**	***p* Value**
Lev	Unmatched	0.6968	0.4606	53.7000	7.6000	0.0000
	Matched	0.6883	0.7018	−3.1000	−0.7600	0.4480
Size	Unmatched	26.8250	22.7040	193.8000	46.2200	0.0000
	Matched	26.6640	26.6890	−1.2000	−0.1300	0.8960
Capexp	Unmatched	21.9230	18.8980	147.2000	27.0500	0.0000
	Matched	21.8470	21.8720	−1.2000	−0.1600	0.8750
Naps	Unmatched	9.9030	5.7713	74.4000	17.1800	0.0000
	Matched	9.9956	10.4320	−7.9000	−0.8600	0.3900
Tq	Unmatched	1.3189	2.2567	−74.8000	−10.9300	0.0000
	Matched	1.3320	1.3660	−2.7000	−0.4700	0.6410
Top10	Unmatched	74.1640	59.9060	84.6000	15.8200	0.0000
	Matched	73.3480	74.1840	−5.0000	−0.6100	0.5390
Wcbii	Unmatched	4.9657	4.0172	103.9000	30.6900	0.0000
	Matched	4.8844	4.9052	−2.3000	−0.2500	0.8040
Variable	Status	Pseudo R^2	LR chi^2	$p > chi^2$	MeanBias	MedBias
All variables	Unmatched	0.3980	1312.4800	0.0000	104.6000	84.6000
	Matched	0.0050	4.8700	0.6760	3.3000	2.7000

Table 10. PSM regression results.

Variable	**Greenw (1)**	**Greenw (2)**
Ass	−2.7188 **	
	(0.0324)	
Ass_q		−3.1043 **
		(0.0414)
Controls	Yes	Yes
_Cons	80.4803 ***	87.3305 ***
	(0.0000)	(0.0000)
Industry and Year	Yes	Yes
N	663	480
Adj R^2	0.2704	0.2636

Note: *** and ** indicate significance at the 1% and 5% levels, respectively. Values in parentheses are P statistics.

The regression coefficient for ESG report assurance (Ass) is −2.7188, which is significant at the 5% level. The regression coefficient for ESG assurance independence (Ass_q) is −3.1043, which is also significant at the 5% level. This finding indicates that, after controlling for relevant factors, ESG assurance significantly suppresses corporate greenwashing behavior, further validating Hypothesis H1.

6.1.2. Instrumental Variable Method

To mitigate potential endogeneity issues arising from reciprocal causation, this study further employs the instrumental variable (IV) method, which uses the average values of ESG report assurance and its independence from other companies facing similar risk levels (Ass_rm and Ass_qrm) as instrumental variables. This is based on the rationale that companies facing similar risk levels exhibit similar characteristics in their ESG assurance decisions, satisfying the relevance requirement. Additionally, the ESG assurance decisions of these other companies do not directly influence the corporate governance level of greenwashing, satisfying the exogeneity requirement. This study also employs extended endogenous model (ERM) and finite information maximum likelihood estimation method (LIML) estimators, with the results presented in Table 11.

Table 11. Regression results using the instrumental variable method.

Variable	First-Stage Ass (1)	Second-Stage Greenw (2)	First-Stage Ass_q (3)	Second-Stage Greenw (4)
Ass_rm	0.9421 *** (0.0000)			
Ass		−3.5177 *** (0.0007)		
Ass_qrm			0.9371 *** (0.0000)	
Ass_q				−2.2359 * (0.0711)
Controls	Yes	Yes	Yes	Yes
_Cons	−0.5675 *** (0.0000)	56.6971 *** (0.0000)	−0.5427 *** (0.0000)	58.2388 *** (0.0000)
Industry & Year	Yes	Yes	Yes	Yes
N	14,376	14,376	14,376	14,376
Pseudo R^2/AdjR^2	0.7532	0.0754	0.7046	0.0749
K-P rk LM statistic	340.7410 ***	-	230.4950 ***	-
C-D Wald F statistic	27,999.4500 ***	-	21,002.7300 ***	-

Note: *** and * indicate significance at the 1% and 10% levels, respectively. Values in parentheses are P statistics.

In column (1), the first-stage IV variable Ass_rm has a regression coefficient of 0.9421, which is significant at the 1% level; in column (3), the first-stage IV variable Ass_qrm has a regression coefficient of 0.9371, which is also significant at the 1% level, indicating good explanatory power of the instrumental variables. In the second stage, the fitted regression coefficient for ESG report assurance (Ass) is −3.5177, which is significant at the 1% level, whereas the fitted regression coefficient for ESG assurance independence (Ass_q) is −2.2359, which is significant at the 10% level. Therefore, even after potential endogeneity issues are addressed, the suppressive effect of ESG assurance on corporate greenwashing behavior remains significant, further validating Hypothesis H1.

6.1.3. Treatment Effect Model

As there is currently no mandatory ESG assurance system in China, companies have the option to conduct ESG assurance voluntarily and to determine their own independence

standards. To address the self-selection issue between ESG assurance and corporate greenwashing behaviors, this study employs a treatment effect model for correction. Specifically, suitable exogenous variables are selected for a first-stage probit regression of ESG assurance, and the inverse Mills ratio (Imr), which is then used as a control variable in the regression model (15), is calculated. Market power (Lerner) is used as an exogenous variable in the probit regression. The core rationale for selecting this exogenous variable is that, within China's unique market economic context, companies with significant market power often have political connections, are more concerned about their reputations, tend to voluntarily engage in ESG assurance, and have higher demands for ESG assurance independence. Furthermore, market power is unrelated to corporate greenwashing behavior. Thus, this exogenous variable meets the requirements of both relevance and exogeneity. The test results are shown in Table 12.

Table 12. Regression results with the treatment effect model.

Variable	First-Stage Ass (1)	Second-Stage Greenw (2)	First-Stage Ass_q (3)	Second-Stage Greenw (4)
Ass		−10.2359 *** (0.0000)		
Ass_q				−9.9470 *** (0.0000)
Lerner	0.5833 *** (0.0001)		0.6218 *** (0.0003)	
Controls	Yes	Yes	Yes	Yes
Imr		3.5646 *** (0.0005)		3.2815 *** (0.0021)
_Cons	−12.7553 *** (0.0000)	104.2644 *** (0.0000)	−16.2287 (0.8675)	105.9460 *** (0.0000)
Industry and Year	Yes	Yes	Yes	Yes
N	14,376	14,376	14,376	14,376
Pseudo R^2/Adj R^2	0.3713	0.5007	0.4202	0.5005

Note: *** indicate significance at the 1% level. Values in parentheses are P statistics.

The coefficients for the exogenous variable market power (Lerner) in the first stage are 0.5833 and 0.6218, both of which are significant at the 1% level, indicating that companies with greater market power are more inclined to conduct voluntary ESG assurance and exhibit greater ESG assurance independence. When the inverse Mills ratio (Imr) estimated from the first stage is included in the second-stage regression, the coefficients for the explanatory variables Ass and Ass_q are −10.2359 and −9.9470, respectively, both of which are significant at the 1% level, confirming the conclusions of this study. Moreover, after introducing the inverse Mills ratio (Imr) for control, the self-selection bias adjustment term (Imr) passes the significance test, indicating the presence of endogenous bias to some extent and affirming the necessity of employing a treatment effect model for correction, enhancing the reliability of this study's conclusions.

6.2. Robustness Test

6.2.1. Generalized Least Squares (FGLS)

To alleviate potential issues of heteroscedasticity and autocorrelation, the feasible generalized least squares (FGLS) method is employed for testing, with the results presented in Table 13.

Table 13. Presents the regression results after transforming the empirical testing methods.

Panel A: Take Ass as the Treatment Variable					
Variable	**Greenw (1)**	**Greenw (2)**	**Greenw (3)**	**Greenw (4)**	**Greenw (5)**
Ass	−2.7847 ***	−2.7429 ***	−9.5666 **	−2.7503 ***	−4.6328 ***
	(0.0009)	(0.0011)	(0.0114)	(0.0010)	(0.0000)
Law		−0.2141 **	−0.2300 **		
		(0.0387)	(0.0272)		
Ass × Law			0.8848 **		
			(0.0457)		
Msh				−0.0223 ***	−0.0221 ***
				(0.0093)	(0.0097)
Ass × Msh					0.2762 **
					(0.0455)
Controls	Yes	Yes	Yes	Yes	Yes
_Cons	93.6373 ***	93.7266 ***	93.8554 ***	95.5140 ***	95.1464 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Industry and Year	Yes	Yes	Yes	Yes	Yes
N	14,376	14,376	14,376	14,376	14,376
Adj R^2	0.6965	0.6908	0.6908	0.6964	0.6960
Panel B: Take Ass_q as the Treatment Variable					
Variable	**Greenw (1)**	**Greenw (2)**	**Greenw (3)**	**Greenw (4)**	**Greenw (5)**
Ass_q	−2.9727 ***	−2.9284 ***	−10.6029 ***	−2.1280 **	−2.8077 ***
	(0.0009)	(0.0010)	(0.0062)	(0.0219)	(0.0036)
Law		−0.2191 **	−0.2333 **		
		(0.0347)	(0.0250)		
Ass_q × Law			0.9653 **		
			(0.0329)		
Msh				−0.0223 ***	−0.0219 **
				(0.0094)	(0.0104)
Ass_q × Msh					0.2558 **
					(0.0117)
Controls	Yes	Yes	Yes	Yes	Yes
_Cons	93.9598 ***	93.9985 ***	94.0938 ***	95.9601 ***	95.6894 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Industry and Year	Yes	Yes	Yes	Yes	Yes
N	14,376	14,376	14,376	14,376	14,376
Adj R^2	0.6963	0.6897	0.6897	0.6966	0.6956

Note: *** and ** indicate significance at the 1% and 5% levels, respectively. Values in parentheses are P statistics.

In Panel A, the regression coefficient of ESG report assurance (Ass) in column (1) is −2.7847, which is significant at the 1% level, indicating that, when controlling for relevant factors, ESG report assurance effectively curtails greenwashing behavior by companies. In column (2), the regression coefficient of ESG report assurance (Ass) against company greenwashing behavior (Greenw) is −2.7429, which is also significant at the 1% level; the coefficient for the legal environment (Law) on greenwashing behavior is −0.2141, which is significant at the 5% level, suggesting that both ESG report assurance and the legal environment serve to effectively suppress greenwashing practices. This finding indicates that external assurance governance and legal oversight can impose effective constraints on corporate behavior. In column (3), the interaction term coefficient between the legal environment (Law) and ESG report assurance (Ass) is 0.8848, which is significant at the 5% level, suggesting that there exists a degree of substitutive effect in governance concerning corporate greenwashing between ESG report assurance and the legal environment; specifically, when the legal environment is weaker, ESG report assurance plays a more

beneficial role in suppressing greenwashing behavior. Column (4) shows that the regression coefficient of ESG report assurance (Ass) on greenwashing behavior (Greenw) is −2.7503, which is significant at the 1% level, whereas the coefficient for managerial shareholding (Msh) on greenwashing is −0.0223, which is significant at the 1% level, indicating that both ESG report assurance and managerial shareholding contribute to the suppression of greenwashing behavior, meaning that both external assurance and internal governance can effectively constrain corporate conduct. In column (5), the interaction term coefficient between managerial shareholding (Msh) and ESG report assurance (Ass) is 0.2762, which is significant at the 5% level, indicating that an increase in managerial shareholding diminishes the suppressive effect of ESG report assurance on corporate greenwashing, reflecting a substitutive relationship in the governance of greenwashing behavior between ESG report assurance and managerial ownership.

In Panel B, the regression coefficient for ESG assurance independence (Ass_q) in column (1) is −2.9727, which is significant at the 1% level, indicating that when controlling for relevant factors, ESG assurance independence effectively suppresses corporate greenwashing behavior. In column (2), the regression coefficient for ESG assurance independence (Ass_q) on corporate greenwashing behavior (Greenw) is −2.9284, which is significant at the 1% statistical level, whereas the legal environment (Law) has a regression coefficient of −0.2191 on corporate greenwashing behavior (Greenw), which is significant at the 5% statistical level. This demonstrates that both ESG assurance independence and the legal environment can effectively curb corporate greenwashing behavior, meaning that external assurance governance and legal oversight can both impose effective constraints on corporate conduct. In column (3), the interaction term coefficient between the legal environment (Law) and ESG assurance independence (Ass_q) is 0.9653, which is significant at the 5% level, suggesting that there is a substitutive relationship in the governance of corporate greenwashing behavior between ESG assurance independence and the legal environment. In weaker legal environments, ESG assurance independence plays a more pivotal role and is thus better at suppressing corporate greenwashing behavior. Column (4) shows that the regression coefficient for ESG assurance independence (Ass_q) on corporate greenwashing behavior (Greenw) is −2.1280, which is significant at the 5% level, whereas the coefficient for managerial shareholding (Msh) on corporate greenwashing behavior (Greenw) is −0.0223, which is significant at the 1% level. These results indicate that both ESG assurance independence and managerial shareholding contribute to suppressing corporate greenwashing behavior, indicating that both external assurance governance and internal governance can effectively constrain corporate conduct. In column (5), the interaction term coefficient between managerial shareholding (Msh) and ESG assurance independence (Ass_q) is 0.2558, which is significant at the 5% statistical level. This finding indicates that increased managerial shareholding diminishes the restraining effect that ESG assurance independence has on corporate greenwashing behavior. This suggests a substitutive effect between ESG assurance independence and managerial shareholding in governing corporate greenwashing activities. Hypotheses H1, H2, and H3a are validated.

6.2.2. Placebo Test

To eliminate the influence of human factors, this study further employs a placebo test. If altering ESG assurance data arbitrarily in the sample results in no significant effect on corporate greenwashing behavior, this indicates that the improvement in governance levels regarding corporate greenwashing is indeed due to ESG assurance factors. Therefore, we define random simulation variables Ass_r and Ass_q_r, maintaining the proportions they occupy in the sample as those of Ass and Ass_q previously mentioned. We subsequently regress these on corporate greenwashing behavior. If the improvement in corporate greenwashing governance levels is attributed to ESG assurance, the coefficients of the random simulation variables Ass_r and Ass_q_r would be insignificant. Consequently, this study conducted 5000 tests, deriving 5000 Z(t) values for the coefficients of the simulated variables.

The distribution of Z(t) values for the coefficients of the simulated independent variables (Ass_r and Ass_q_r) in relation to ESG report assurance and ESG assurance independence is illustrated in Figure 5.

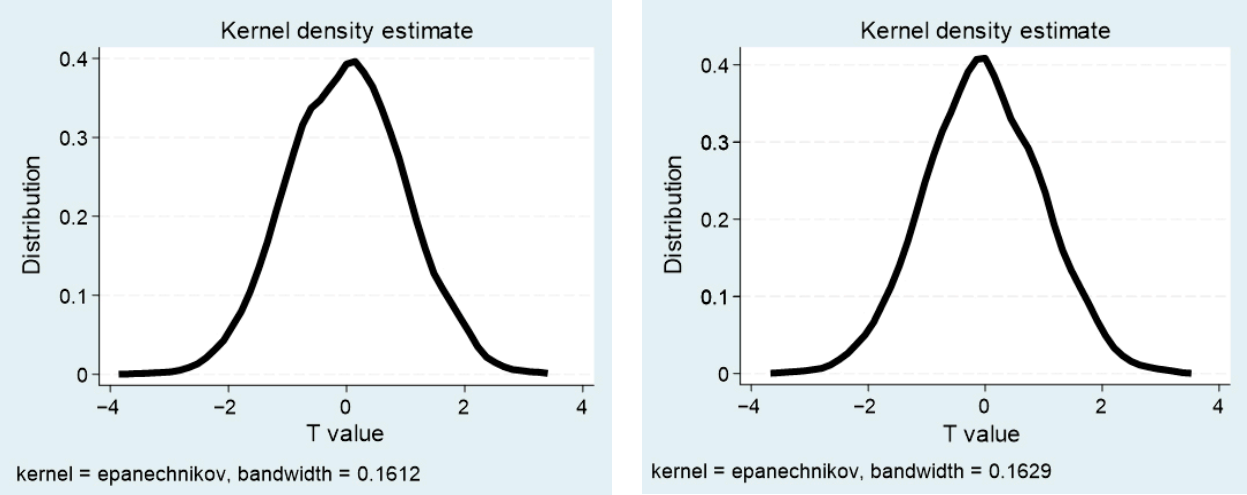

Figure 5. The distribution of Z(t) values for the coefficients of the simulated independent variables. (**a**) Results based on Ass_r. (**b**) Results based on Ass_q_r.

The distribution of Z(t) values for the simulated independent variables Ass_r and Ass_q_r is centered at approximately 0, indicating that the regression coefficients are statistically insignificant. This suggests that artificially randomizing the ESG assurance data does not yield a significant effect on the indicators of corporate greenwashing behavior, thereby indicating that the empirical results presented in this study are not a result of unobservable factors.

6.2.3. Bootstrap Method

The bootstrap method is employed for validation in this study to increase the robustness of the research conclusions. The verification results with corporate greenwashing behavior (Greenw) as the dependent variable are presented in Table 14.

Table 14. Bootstrap method verification results.

Panel A: Take Ass as the Response Variable							
	Observed Coef.	**Bootstrap Std. Err.**	**z**	**P [95%Conf. Interval]**		**BC [95%Conf. Interval]**	
Direct effect	−3.3549	0.8235	−4.07 ***	−4.8901	−1.6165	−5.0570	−1.7715
Intermediary effect	−0.0763	0.0378	−2.02 **	−0.1567	−0.0086	−0.1860	−0.0213
Panel B: Take Ass_q as the Response Variable							
	Observed Coef.	**Bootstrap Std. Err.**	**z**	**P [95%Conf. Interval]**		**BC [95%Conf. Interval]**	
Direct effect	−2.0571	0.9350	−2.20 **	−3.8774	−0.2143	−3.9924	−0.3134
Intermediary effect	−0.1022	0.0434	−2.36 **	−0.1851	−0.0196	−0.2433	−0.0402

Note: *** and ** indicate significance at the 1% and 5% levels, respectively.

Panel A reports the results when Ass is used as the response variable; the direct effect coefficient is significantly negative at the 1% level, with the 95% confidence interval and bias-corrected confidence interval being [−4.8901, −1.6165] and [−5.0570, −1.7715], respectively, with both intervals excluding 0. The mediation effect coefficient is significantly

negative at the 5% level, with the 95% confidence interval and bias-corrected confidence interval being [−0.1567, −0.0086] and [−0.1860, −0.0213], respectively, both excluding 0. Thus, the direct facilitating effect of ESG report assurance on corporate greenwashing governance and the partial mediating effect of corporate ESG performance between the two are both significant. Panel B presents the results with Ass_q as the response variable; the direct effect coefficient is significantly negative at the 5% level, with the 95% confidence interval and bias-corrected confidence interval being [−3.8774, −0.2143] and [−3.9924, −0.3134], both intervals excluding 0. The mediation effect coefficient is significantly negative at the 5% level, with the 95% confidence interval and bias-corrected confidence interval being [−0.1851, −0.0196] and [−0.2433, −0.0402], respectively, both excluding 0. Therefore, the direct facilitating effect of ESG independence on corporate greenwashing governance and the partial mediating effect of corporate ESG performance between the two are both significant.

6.2.4. Alternative Variable Measurement Methods

This study adopts the Bloomberg ESG rating system to reassess corporate ESG performance (Bperf_esg). Table 15 reports the regression results for ESG assurance, corporate ESG performance, and corporate greenwashing governance.

Table 15. Regression results of ESG assurance, corporate ESG performance, and corporate greenwashing governance.

Variable	Bperf_esg (1)	Greenw (2)	Bperf_esg (3)	Greenw (4)
Ass	5.3477 ***	−1.9622 ***		
	(0.0000)	(−2.7809)		
Ass_q			3.9364 ***	−3.0043 ***
			(0.0000)	(0.0002)
Bperf_esg		−0.4726 ***		−0.4674 ***
		(0.0000)		(0.0000)
Controls	Yes	Yes	Yes	Yes
_Cons	−7.9389 ***	105.4771 ***	−10.0608 ***	105.4727 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Industry and Year	Yes	Yes	Yes	Yes
N	14,376	14,376	14,376	14,376
Adj R^2	0.4084	0.5267	0.4062	0.5262

Note: *** indicate significance at the 1% level. Values in parentheses are P statistics.

In column (1) of Table 6, the regression coefficient for ESG report assurance (Ass) is −3.5552, which is significant at the 1% level, suggesting that ESG report assurance has a suppressive effect on corporate greenwashing behavior. In column (1) of Table 15, the regression coefficient for ESG report assurance (Ass) is 5.3477, which is significant at the 1% level, indicating that, controlling for related factors, ESG report assurance significantly promotes the improvement of corporate ESG performance. In column (2), the regression coefficient for ESG report assurance (Ass) is −1.9622, which is significant at the 1% level, whereas the regression coefficient for corporate ESG performance (Bperf_esg) is −0.4726, which is also significant at the 1% level, revealing a partial mediating effect of corporate ESG performance on the relationship between ESG report assurance and corporate greenwashing governance, controlling for related factors. Furthermore, the regression coefficient for ESG report assurance (Ass) increases from −3.5552 in column (1) of Table 6 to −1.9622 in column (2) of Table 15, with α_1 and $\delta_1\lambda_2$ both being positive, indicating that corporate ESG performance is a partial mediator in the facilitation of corporate greenwashing governance by ESG report assurance, accounting for 71.0881% of the effect ($\delta_1\lambda_2/\alpha_1$). In column (2) of Table 6, the regression coefficient for ESG assurance independence (Ass_q) is −3.7637, which is significant at the 1% level, indicating that ESG assurance independence suppresses corporate greenwashing behavior. In column (3) of Table 15, the regression coefficient

for ESG assurance independence (Ass_q) is 3.9364, which is significant at the 1% level, suggesting that ESG assurance independence significantly promotes the enhancement of corporate ESG performance. In column (4) of Table 15, the regression coefficient for ESG assurance independence (Ass_q) is −3.0043, which is significant at the 1% level, whereas the regression coefficient for corporate ESG performance (Bperf_esg) is −0.4674, which is also significant at the 1% level, indicating a partial mediating effect of corporate ESG performance on the relationship between ESG assurance independence and corporate greenwashing governance, including related factors. Additionally, the regression coefficient for ESG assurance independence (Ass_q) increases from −3.7637 in column (2) of Table 6 to −3.0043 in column (4), with α_1 and $\delta_1\lambda_2$ both being positive, confirming that corporate ESG performance serves as a partial mediator in the facilitation of corporate greenwashing governance by ESG assurance independence, accounting for 48.8847% of the effect ($\delta_1\lambda_2/\alpha_1$).

7. Discussion and Implications

7.1. Key Findings

This study aims to construct a theoretical framework for the ESG assurance governance of corporate greenwashing behaviors on the basis of neoclassical economics, information economics, institutional economics, fraud triangle theory, agency theory, and game theory through theoretical and evolutionary game analyses. It systematically studies the governance effects of ESG assurance on corporate greenwashing behaviors, as well as the impacts of the external environment (the rule of law environment) and company-specific traits (ownership structure and managerial ownership). Additionally, it further analyzes the intrinsic influence mechanism of ESG assurance on corporate greenwashing behaviors from the perspective of corporate ESG performance, contributing optimization suggestions for enhancing the ESG assurance governance of corporate greenwashing behaviors. This study effectively addresses research questions such as "How can a theoretical framework for ESG assurance governance of corporate greenwashing behaviors be constructed?", "What are the governance effects of ESG assurance on corporate greenwashing behaviors?", "What roles do internal and external factors play?", "What is the intrinsic influence mechanism of ESG assurance on corporate greenwashing behaviors?", and "What optimization suggestions can be provided?" The findings of this study indicate that ESG assurance has a significant inhibitory effect on corporate greenwashing behavior, playing a crucial role in resource allocation, particularly in non-state-owned enterprises. The legal environment and the effect of ESG assurance on the inhibition of greenwashing exhibit a certain substitutive effect. That is, when the legal environment is weaker, ESG assurance is more effective in curbing corporate greenwashing. Moreover, management shareholding and ESG assurance also have a substitutive effect on their inhibitory influence on greenwashing behavior. That is, when management shareholding is low, ESG assurance becomes increasingly effective at suppressing such behavior. Further research reveals that ESG assurance plays a key role in governing corporate greenwashing by enhancing a company's ESG performance. By situating the research within the current institutional environment and historical context of China and combining the external environment (the rule-of-law environment) with company-specific traits (ownership structure, managerial ownership, and corporate ESG performance), this study explores the governance effects, influencing factors, and mechanisms of ESG assurance over corporate greenwashing behaviors. This study contributes to research on ESG assurance regulation and information fraud governance, aiming to provide theoretical guidance, empirical evidence, and optimization suggestions for constructing and refining the theoretical system of ESG assurance and industry practices. This contribution is intended to promote the future rollout of ESG assurance, enhance corporate ESG performance, and curb corporate greenwashing behaviors.

7.2. Discussion

First, to address the research questions "How can a theoretical framework be constructed for the governance of corporate greenwashing through ESG assurance?" and "What is the effectiveness of ESG assurance in addressing corporate greenwashing behaviors?", this paper verified Hypothesis 1. On the basis of the key finding that ESG assurance can effectively restrain corporate greenwashing behavior, we recommend that policymakers expedite the establishment of a mandatory assurance system for ESG reports. Numerous scholars have studied ESG performance and disclosure [65–70], ESG investment [71,72], and ESG value [73,74], while research in the emerging field of ESG assurance remains relatively scarce. This study seeks to extend the assurance functions into ESG research and examine its economic implications. Practically, the current coverage of ESG assurance is limited, primarily due to the covert and technical nature of greenwashing behaviors [2], which have not garnered sufficient attention from policymakers and other stakeholders [75], who fail to recognize that ESG assurance is critical for identification, assessment, monitoring, and prevention. Consequently, voluntary assurance prevails. Policymakers should consider widening the scope of mandatory ESG assurance, gradually implementing it comprehensively to ensure that ESG reports receive the same level of scrutiny as financial reports. This approach would enable ESG report assurance to operate alongside financial report auditing, helping companies enhance their awareness of ESG principles and quality of information disclosure. Policymakers' attention will inevitably promote the further refinement of mandatory ESG assurance systems, thus enhancing the reliability of ESG reports. Additionally, we suggest that policymakers should balance the costs and reliability of ESG assurance, particularly during the initial stages of policy implementation, seeking equilibrium between ESG assurance costs and reliability for businesses. The cost of ESG assurance is a significant factor influencing whether companies undertake voluntary assurance [76]. Given the current economic downturn in China, many companies refrain from conducting ESG assurance due to operational pressures and the absence of a mandatory ESG assurance system. Furthermore, the Ministry of Industry and Information Technology should establish sound regulations and systems to promote a comprehensive, robust ESG information dynamic monitoring system. By harnessing digital technologies such as artificial intelligence, blockchain, cloud computing, big data, and the Internet of Things, this system can systematically collect, efficiently analyze, and accurately trace information and major risks related to climate, environment, ecology, accountability, and governance while integrating information from the National Bureau of Statistics, the China Securities Regulatory Commission, the Ministry of Ecology and Environment, and the National Development and Reform Commission to continually solidify the data foundation. This will help mitigate the moral risks resulting from speculative greenwashing, increase the willingness of companies to conduct ESG assurance, effectively prevent "greenwashing" behaviors, and create a favorable environment for high-quality economic development in China.

Second, to address the research questions "How do external and internal factors play a role in this context?", this paper verified Hypotheses 1 and 2. On the basis of the key finding that ESG assurance plays a more active role in suppressing greenwashing behaviors in non-state-owned enterprises, and there exists a substitutive effect of legal environment and management shareholding in the governance of corporate greenwashing behavior through ESG assurance, we recommend that regulatory agencies develop differentiated ESG regulatory strategies according to the characteristics of different types of enterprises while identifying key governance targets and avoiding oversight due to biases. Jiang et al. (2021) argued that there are significant differences in enterprise objectives and decision-making processes between state-owned and non-state-owned enterprises in their pursuit of survival and development [77]. While considering the principles of relevance and timeliness of information, one must also weigh materiality against the substance-over-form principle. The literature on financial auditing suggests that audit entities should pay particular attention to the environmental contexts of client regions [78] and emerging management

trends [79,80], as this focus will increase the effectiveness of auditing. Both ESG assurance and financial auditing fall under third-party assurance services and therefore share certain similarities. Although the findings of this study indicate that "the legal environment and management shareholding present some substitutive effects in the governance of corporate greenwashing behaviors", the legal environment varies significantly depending on the region of the company [81], whereas individual disparities in management shareholding are markedly pronounced [82]; neither factor alone can have a large-scale effect on the governance of greenwashing behaviors across the market. Thus, we recommend that regulatory agencies, guided by financial information regulatory provisions, mandate that only independently assured ESG report information may be publicly disclosed. Furthermore, companies must disclose both their ESG reports and accompanying assurance reports to promote a coequal regulatory approach towards financial reporting information and ESG reporting information, thereby enhancing the overall quality of corporate information systems. This approach is expected to bolster the credibility of information and the efficiency of capital markets, ultimately encouraging companies to genuinely enhance their ESG performance and avert greenwashing behaviors. Additionally, we suggest that regulatory agencies accelerate the establishment of relevant standards to fully promote the formulation of ESG assurance guidelines and norms while explicitly defining assurance or conduct. Given that independence is the essence of assurance, enforcing necessary provisions for enhancing the independence of ESG assurance will improve the quality of ESG assurance and the effectiveness of governance over corporate greenwashing behaviors.

Third, to address the research questions "What are the inherent mechanisms by which ESG assurance governs corporate greenwashing behaviors?" and "What referenceable optimization strategies can be proposed?", this paper conducts analysis, empirical testing, and in-depth exploration of referenceable optimization strategies. On the basis of the key finding that the performance of corporate ESG plays a partial mediating role between ESG assurance and the governance of greenwashing behavior, we recommend that companies actively implement ESG assurance to increase their ESG performance, thereby avoiding greenwashing behaviors caused by moral hazards and conflicts of interest. Companies should actively facilitate the transmission mechanism of the positive external governance role of ESG assurance, establish a value system that adheres to long-term coordinated development with the external environment, and accelerate the improvement of their corporate governance framework by appointing chief compliance officers, strengthening compliance reviews, and reducing greenwashing risk. Research suggests a negative correlation between corporate ESG performance and moral hazards [83], whereas external governance positively contributes to improving corporate ESG performance [84], thereby promoting the achievement of sustainable development goals. Companies should actively engage relevant theoretical experts and experienced practitioners to conduct environmental, social, and governance forum activities; disseminate ESG knowledge among employees; and enhance the promotion of ESG concepts, especially concerning ecological civilization construction, economic green transformation, emissions reduction, and the development of new energy. This will help strengthen risk prevention awareness and ESG oversight [85], create a favorable corporate environment and reinforce internal supervision against greenwashing. Furthermore, companies should focus on promoting ESG concepts among potential investors in the capital market to increase their awareness, which will lead to positive feedback [86] and compel companies to genuinely improve their ESG performance while consciously avoiding greenwashing behavior. Stakeholder attention to ESG report information promotes the optimization of corporate ESG report assurance systems and the accomplishment of corporate ESG objectives, thereby increasing the reliability of ESG reports.

7.3. Implications

This study's theoretical contributions are twofold: First, it breaks away from previous studies that primarily discuss ESG information disclosure, focusing instead on assurance governance aimed at improving the quality of ESG information disclosure to enhance

governance over corporate greenwashing behavior. This work expands the boundaries of classical assurance theory application. Compared to related works revealing that regulatory pressures lead to economic and environmental benefits for firms [24,87–89], this paper highlights the theoretical perspectives on assurance governance in the ESG field, filling the gap in the existing literature regarding the disconnect between assurance functions and ESG field research. This may attract academic attention to the research questions posed herein and provide prospective theoretical support for subsequent related studies. Second, this study attempts to clarify the theoretical logic of ESG assurance on the governance of corporate greenwashing behavior, conducting evolutionary game analysis on the basis of multiparty decision-making psychology. By considering various factors and the Chinese development environment, we discuss the effects of governance, influencing factors, and mechanisms of ESG assurance on corporate greenwashing behavior based on multidimensional embeddedness, thereby promoting innovative development in assurance theory to address issues in the ESG field through interdisciplinary integration.

The practical contributions of this study are also twofold: First, as environmental, social, and governance issues become increasingly significant, extensive practical needs necessitate research guidance and support. This study aims to address this need by advancing the assurance functions in the ESG practice field to provide guidance and strategies to avoid irrational and unbalanced decision-making. Second, this study focuses on key practical issues and holds significant application value for the comprehensive promotion of ESG assurance by governments, industries, and companies, enhancing ESG performance and curtailing corporate greenwashing behavior. This study offers feasible paths and optimization suggestions to address the current downwards pressure on the economy, with the goal of providing assistance and strength to professionals in related fields domestically and internationally.

8. Conclusions and Future Studies

8.1. Conclusions

Drawing on neoclassical economics, information economics, institutional economics, fraud triangle theory, agency theory, and game theory, a theoretical framework was constructed through theoretical analysis and evolutionary game analysis to govern corporate greenwashing behaviors through ESG assurance. A systematic investigation into the effectiveness of ESG assurance in combating corporate greenwashing addresses the influence of the external environment and internal characteristics of companies. This study examines the inherent influencing mechanisms of ESG assurance on corporate greenwashing behaviors from the perspective of corporate ESG performance, offering suggestions for optimizing the governance of greenwashing behaviors. Research has shown that ESG assurance can effectively suppress corporate greenwashing behavior, especially in non-state-owned enterprises. The rule of law environment has a certain substitutive effect on ESG assurance, meaning that in weaker legal environments, ESG assurance is more effective in suppressing corporate greenwashing behavior. The shareholding of top management also has a certain substitutive effect on ESG assurance, indicating that when top management shareholding is lower, ESG assurance is more effective in suppressing corporate greenwashing behavior. Further research reveals that corporate ESG performance plays a partial mediating role between ESG assurance and the governance of corporate greenwashing behavior. This paper enriches the relevant research on the governance of corporate greenwashing behavior through ESG assurance and thereby provided a reference regarding policy and pathways to enhance corporate ESG performance and the governance of greenwashing behavior.

8.2. Limitations and Future Studies

Several limitations of the present study should be noted: First, this paper examined how corporate greenwashing behavior is governed through ESG assurance, using data from Chinese A-share listed companies. Nonetheless, the effectiveness of ESG assurance can vary significantly between different regions and provinces, and factors at the individual

and regional levels may also differ. To gain a more detailed understanding, future research should focus on refining by individuals and regions. Second, this study only considers one mediating variable, namely, corporate ESG performance. However, there are other factors that can influence the restraining effect of ESG assurance on corporate greenwashing behavior. Future research should discuss more mediating variables between ESG assurance and governance of corporate greenwashing. Third, due to issues related to data acquisition, there is a lack of research on non-listed companies, and there are differences among companies in different industries. This study focuses on a comprehensive analysis, but further research should focus on specific industries.

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References

1. Hazaea, S.A.; Zhu, J.Y.; Khatib, S.F.A.; Bazhair, A.H.; Elamer, A.A. Sustainability assurance practices: A systematic review and future research agenda. *Environ. Sci. Pollut. Res. Int.* **2021**, *29*, 4843–4864. [CrossRef] [PubMed]
2. Laufer, W.S. Social accountability and corporate greenwashing. *J. Bus. Ethics* **2003**, *43*, 253–261. [CrossRef]
3. Bakarich, K.M.; Baranek, D.; O'Brien, P.E. The current state and future implications of environmental, social, and governance assurance. *Curr. Issues Audit.* **2023**, *17*, A1–A21. [CrossRef]
4. Cai, C. Preliminary Thoughts on Constructing the Research Framework for ESG Assurance. In Proceedings of the 2022 Academic Seminar on Resource and Environmental Audit of the Education Branch of the Chinese Auditing Society, Beijing, China, 5–6 November 2022.
5. Uyar, A.; Karaman, A.S.; Kilic, M. Is corporate social responsibility reporting a tool of signalling or greenwashing? Evidence from the worldwide logistics. *J. Clean. Prod.* **2020**, *253*, 119997. [CrossRef]
6. Deloitte. ESG Assurance Helps Companies Improve the Quality of Information Disclosure. Available online: https://www2.deloitte.com/cn/zh/pages/risk/articles/high-quality-info-disclosure.html (accessed on 1 January 2020).
7. IFAC, AICPA, CIMA. Sustainability Reporting and Assurance Practices of Largest Global Companies Continue to Mature, IFAC, AICPA & CIMA Study Shows. Available online: https://www.aicpa-cima.com/news/article/sustainability-reporting-and-assurance-practices-of-largest-global-companies (accessed on 22 February 2024).
8. Kpmg. High Quality ESG Reporting Depends on High Quality Assurance. Available online: https://kpmg.com/cn/zh/home/insights/2023/04/high-quality-esg-reporting-depends-on-high-quality-assurance.html (accessed on 1 January 2024).
9. Kpmg. Survey of Sustainability Reporting—2022 China Insights. Available online: https://assets.kpmg.com/content/dam/kpmg/cn/pdf/zh/2023/01/survey-of-sustainability-reporting-2022-china-insights.pdf (accessed on 1 January 2023).
10. Du, X.Q. How the market values greenwashing? Evidence from China. *J. Bus. Ethics* **2015**, *128*, 547–574. [CrossRef]
11. Bui, B.; Houqe, M.N.; Zaman, M. Climate change mitigation: Carbon assurance and reporting integrity. *Bus. Strat. Environ.* **2021**, *30*, 3839–3853. [CrossRef]
12. Sierra, G.L.; Bollas, A.H.M.; García, B.M.A. Sustainable development goals and assurance of non-financial information reporting in Spain. *Sustain. Account. Manag.* **2022**, *13*, 878–898. [CrossRef]
13. Dhaliwal, D.S.; Li, O.Z.; Tsang, A.; Yang, Y.G. Voluntary nonfinancial disclosure and the cost of equity capital: The initiation of corporate social responsibility reporting. *Account. Rev.* **2011**, *86*, 59–100. [CrossRef]

14. Parguel, B.; Benoît, M.F.; Larceneux, F. How sustainability ratings might deter "greenwashing": A closer look at ethical corporate communication. *J. Bus. Ethics* **2011**, *102*, 15–28. [CrossRef]
15. Choi, M.; Hong, S. Another form of greenwashing: The effects of chaebol firms' corporate governance performance on the donations. *Sustainability* **2022**, *14*, 3373. [CrossRef]
16. Delmas, M.A.; Burbano, V.C. The drivers of greenwashing. *Calif. Manag. Rev.* **2011**, *54*, 64–87. [CrossRef]
17. Seele, P.; Gatti, L. Greenwashing revisited: In search of a typology and accusation-based definition incorporating legitimacy strategies. *Bus. Strat. Environ.* **2017**, *26*, 239–252. [CrossRef]
18. Asante-Appiah, B.; Lambert, T.A. The role of the external auditor in managing environmental, social, and governance (ESG) reputation risk. *Rev. Account. Stud.* **2023**, *28*, 2589–2641. [CrossRef]
19. Eulerich, M.; Bonrath, A.; Lopez, K.V. Internal auditor's role in ESG disclosure and assurance: An analysis of practical insights. *Corp. Ownersh. Control* **2022**, *20*, 78–86. [CrossRef]
20. Frost, T.; Cao, H. Environmental, social, and governance (ESG) disclosure research: A literature review. *Brit. Account. Rev.* **2023**, *55*, 101149. [CrossRef]
21. Solow, R.M. The economics of resources or the resources of economics. *Am. Econ. Rev.* **1974**, *64*, 257–276. [CrossRef]
22. Guo, S. Environmental options of local governments for regional air pollution joint control: Application of evolutionary game theory. *Econ. Polit. Stud.* **2016**, *4*, 238–257. [CrossRef]
23. Xu, X.D.; Zeng, S.X.; Tam, C.M. Stock market's reaction to disclosure of environmental violations: Evidence from China. *J. Bus. Ethics* **2012**, *107*, 227–237. [CrossRef]
24. Lee, M.J.; Pak, A.; Roh, T. The interplay of institutional pressures, digitalization capability, environmental, social, and governance strategy, and triple bottom line performance: A moderated mediation model. *Bus. Strat. Environ.* **2024**, *33*, 5247–5268. [CrossRef]
25. Zyznarska, D.B. Financial and ESG reporting in times of uncertainty. *Theor. J. Account.* **2022**, *46*, 161–180. [CrossRef]
26. Jensen, M.C.; Meckling, W.H. Theory of the firms managerial behavior, agency costs and ownership structure. *J. Financ. Econ.* **1976**, *3*, 305–360. [CrossRef]
27. Wu, Y.; Zhang, K.F.; Xie, J.H. Bad greenwashing, good greenwashing: Corporate social responsibility and information transparency. *Manag. Sci.* **2020**, *66*, 3095–3112. [CrossRef]
28. Watts, R.L.; Zimmerman, J.L. Agency problems, auditing, and the theory of the firm: Some evidence. *J. Law Econ.* **1983**, *26*, 613–633. [CrossRef]
29. Krishnamurti, C.; Velayutham, E. The influence of board committee structures on voluntary disclosure of greenhouse gas emissions: Australian evidence. *Pac.-Basin Financ. J.* **2018**, *50*, 65–81. [CrossRef]
30. Mehran, H. Executive compensation structure, ownership and firm performance. *J. Financ. Econ.* **1995**, *38*, 163–184. [CrossRef]
31. Fama, E.F.; Jensen, M.C. Separation of ownership and control. *J. Law Econ.* **1983**, *26*, 301–325. [CrossRef]
32. Dong, Z.; Ma, P. Managerial ownership: Entrenchment or convergence-of-interest—Based on the decisive effect of internal control. *J. Xi'an Jiaotong Univ. (Soc. Sci.)* **2019**, *39*, 23–31. [CrossRef]
33. Weston, J.F.; Mulherin, J.; Harold, M.M. *Takeovers, Restructuring, and Corporate Governance*, 4th ed.; Prentice Hall: Upper Saddle River, NJ, USA, 2013.
34. Beyer, M.; Czarnizki, D.; Kraft, K. Managerial ownership, entrenchment and innovation. *Econ. Innov. New Technol.* **2012**, *21*, 679–699. [CrossRef]
35. Yang, Z.; Song, P.; Xu, M.; Li, Y. Environmental, social and governance performance and equity mispricing: Does embedded information mediation matter? *Financ. Res. Lett.* **2024**, *67*, 105922. [CrossRef]
36. Kusumawati, E.; Setiawan, A. The effect of managerial ownership, institutional ownership, company growth, liquidity, and profitability on company value. *Ris. Akunt. Dan Keuang. Indones.* **2019**, *4*, 136–146.
37. Kao, M.F.; Jian, C.H.; Tseng, C.H. Managerial ability and voluntary ESG disclosure and assurance: Evidence from Taiwan. *Sustain. Account. Manag.* **2024**, *15*, 207–231. [CrossRef]
38. Harasheh, M.; Provasi, R. A need for assurance: Do internal control systems integrate environmental, social, and governance factors? *Corp. Soc. Responsib. Environ. Manag.* **2023**, *30*, 384–401. [CrossRef]
39. Sun, Y.; Zhao, D.; Cao, Y. The impact of ESG performance, reporting framework, and reporting assurance on the tone of ESG disclosures: Evidence from Chinese listed firms. *J. Clean. Prod.* **2024**, *466*, 142698. [CrossRef]
40. The Role of Auditors in Company-Prepared ESG Information: A Deeper Dive on Assurance. Available online: https://www.thecaq.org/wp-content/uploads/2021/03/caq_rota-esg-a-deeper-dive-on-assurance_2021-03.pdf (accessed on 1 March 2021).
41. Peterson, J. The future of external audit: Issues and questions. *Int. J. Audit.* **2022**, *26*, 14–17. [CrossRef]
42. Kim, J.W.; Park, C.K. Can ESG performance mitigate information asymmetry? Moderating effect of assurance services. *Appl. Econ.* **2023**, *55*, 2993–3007. [CrossRef]
43. Simpson, S.N.Y.; Aboagye, O.F.; Ahadzie, R. Assurance of environmental, social and governance disclosures in a developing country: Perspectives of regulators and quasi-regulators. *Account. Forum* **2022**, *46*, 109–133. [CrossRef]
44. Yu, G.; Jun, D.; Vasarhelyi, M.A. Audit 4.0-based ESG assurance: An example of using satellite images on GHG emissions. *Int. J. Account. Inf. Syst.* **2023**, *50*, 100625. [CrossRef]
45. Chen, H.W.; Han, H.L. *Audit Theory*, 1st ed.; China Machine Press: Beijing, China, 2009.
46. Walker, K.; Wan, F. The harm of symbolic actions and green-washing: Corporate actions and communications on environmental performance and their financial implications. *J. Bus. Ethics* **2012**, *109*, 227–242. [CrossRef]

47. Huang, R.; Chen, W.; Wang, K. External financing demand, impression management and enterprise greenwashing. *Comp. Econ. Soc. Syst.* **2019**, *3*, 81–93.
48. Huang, R.B.; Chu, F. The central supervision of eco-environmental protection, pressure of economic performance appraisal, and corporate greenwashing. *J. China Univ. Geosci. (Soc. Sci. Ed.)* **2023**, *23*, 70–86.
49. Meigs, W.B.; Whittington, O.R.; Pany, K.; Meigs, R.F. *Principles of Auditing*, 10th ed.; Richard D. Irwin, Inc.: Homewood, IL, USA, 1992.
50. O'Dwyer, B.; Owen, D.L. Assurance statement practice in environmental, social and sustainability reporting: A critical evaluation. *Brit. Account. Rev.* **2005**, *37*, 205–229. [CrossRef]
51. Wang, S.; Zhou, Z.; Tian, K. Environmental awareness and environmental information disclosure: An empirical study based on energy industry. *Front. Psychol.* **2022**, *13*, 1038040. [CrossRef] [PubMed]
52. Allen, F.; Qian, J.; Qian, M. Law, finance, and economic growth in China. *J. Financ. Econ.* **2005**, *77*, 57–116. [CrossRef]
53. Wang, X.L.; Hu, L.P.; Fan, G. *Marketization Index of China's Provinces: Neri Report 2021*, 1st ed.; Social Sciences Academic Press: Beijing, China, 2021.
54. Yang, Y.D.; Xu, G.H.; Shen, Y. "From outside to inside": The dynamic evolutionary logic of the risk—Resilient effects of corporate ESG performance. *Account. Res.* **2023**, *2*, 12–26.
55. Yu, H.; Huang, S.; Song, Z.J. Can state ownership participation improve firms' ESG performance? Empirical evidence from private listed firms. *J. Shanghai Univ. Financ. Econ.* **2024**, *26*, 64–78+123. [CrossRef]
56. Bermane, B. Environmental regulation and productivity: Evidence from oil refineries. *Rev. Econ. Stat.* **2001**, *83*, 498–510. [CrossRef]
57. Lyon, T.P.; Montgomery, A.W. Tweetjacked: The impact of social media on corporate greenwash. *J. Bus. Ethics* **2013**, *118*, 747–757. [CrossRef]
58. Wen, Z.L.; Ye, B.J. Analyses of mediating effects: The development of methods and models. *Adv. Psychol. Sci.* **2014**, *22*, 731–745. [CrossRef]
59. Zhang, L.; Li, D.Y.; Cao, C.C.; Huang, S.H. The influence of greenwashing perception on green purchasing intentions: The mediating role of green word-of-mouth and moderating role of green concern. *J. Clean. Prod.* **2018**, *187*, 740–750. [CrossRef]
60. Bu, M.W.; Zhang, J.M. Entrepreneurship, audit quality and corporate value: Based on the empirical evidence of listed companies in China. *J. China Univ. Financ. Econ.* **2021**, *3*, 74–87. [CrossRef]
61. Wong, A.K.F.; Kim, S.S. Development and validation of standard hotel corporate social responsibility (CSR) scale from the employee perspective. *Int. J. Hosp. Manag.* **2020**, *87*, 102507. [CrossRef]
62. Bian, J.; Liao, Y.; Wang, Y.Y. Analysis of firm CSR strategies. *Eur. J. Oper. Res.* **2020**, *290*, 914–926. [CrossRef]
63. García-Sánchez, I.M.; Hussain, N.; Martínez-Ferrero, J.; Ruiz-Barbadillo, E. Impact of disclosure and assurance quality of corporate sustainability reports on access to finance. *Corp. Soc. Responsib. Environ. Manag.* **2019**, *26*, 832–848. [CrossRef]
64. Chen, Y.S.; Lai, S.B.; Wen, C.T. The influence of green innovation performance on corporate advantage in Taiwan. *J. Bus. Ethics* **2006**, *67*, 331–339. [CrossRef]
65. Baldini, M.; Maso, L.D.; Liberatore, G.; Mazzi, F.; Terzani, S. Role of country- and firm-level determinants in environmental, social, and governance disclosure. *J. Bus. Ethics* **2018**, *150*, 79–98. [CrossRef]
66. Borralho, J.M.; Hernández-Linares, R.; Gallardo-Vázquez, D.; Paiva, I.C.S. Environmental, social and governance disclosure's impacts on earnings management: Family versus non-family firms. *J. Clean. Prod.* **2022**, *379*, 134603. [CrossRef]
67. Chen, Z.; Xie, G. ESG disclosure and financial performance: Moderating role of ESG investors. *Int. Rev. Financ. Anal.* **2022**, *83*, 102291. [CrossRef]
68. Feng, Z.; Wu, Z. ESG disclosure, REIT debt financing and firm value. *J. Real. Estate Financ.* **2023**, *67*, 388–422. [CrossRef]
69. Raimo, N.; Caragnano, A.; Zito, M.; Vitolla, F.; Mariani, M. Extending the benefits of ESG disclosure: The effect on the cost of debt financing. *Corp. Soc. Responsib. Environ. Manag.* **2021**, *28*, 1412–1421. [CrossRef]
70. Li, Y.; Li, S. ESG performance and innovation quality. *Int. Rev. Econ. Financ.* **2024**, *92*, 1361–1373. [CrossRef]
71. Pedersen, L.H.; Fitzgibbons, S.; Pomorski, L. Responsible investing: The ESG-efficient frontier. *J. Financ. Econ.* **2021**, *142*, 572–597. [CrossRef]
72. Ben-David, I.; Li, J.; Rossi, A.; Song, Y. What do mutual fund investors truly care about? *Rev. Financ. Stud.* **2022**, *35*, 1723–1774. [CrossRef]
73. Cui, X.; Wang, C.; Sensoy, A.; Liao, J.; Xie, X. Economic policy uncertainty and green innovation: Evidence from China. *Econ. Model.* **2023**, *118*, 106104. [CrossRef]
74. Bhandari, K.R.; Ranta, M.; Salo, J. The resource based view, stakeholder capitalism, ESG, and sustainable competitive advantage: The Firm's embeddedness into ecology, society, and governance. *Bus. Strat. Environ.* **2022**, *31*, 1525–1537. [CrossRef]
75. Bell, T.B.; Landsman, W.R.; Shackelford, D.A. Auditors' perceived business risk and audit fees: Analysis and evidence. *J. Account. Res.* **2001**, *39*, 35–43. [CrossRef]
76. Simunic, D.A. The pricing of audit services: Theory and evidence. *J. Account. Res.* **1980**, *18*, 161–190. [CrossRef]
77. Jiang, F.; Wang, Y.; Li, X. On the connotation of entrepreneurship in Chinese state-owned enterprises. *J. R. Univ. China* **2021**, *35*, 84–94.
78. Chen, Y.; Zhu, S.; Wang, Y. Corporate fraud and bank loans: Evidence from China. *China J. Account. Res.* **2011**, *4*, 155–165. [CrossRef]

79. Ho, C.L.; Lai, G.C.; Lee, J.P. Corporate governance, audit quality and risk taking in the U.S. property casualty insurance industry. *Corp. Ownersh. Control* **2009**, *7*, 84–95. [CrossRef]
80. Hu, J.; Li, X.; Wan, Z. Corporate corruption and future audit fees: Evidence from a quasi-natural experiment. *J. Contemp. Account. Econ.* **2023**, *19*, 100367. [CrossRef]
81. Garcia, A.S.; Orsato, R.J. Testing the institutional difference hypothesis: A study about environmental, social, governance, and financial performance. *Bus. Strat. Environ.* **2020**, *29*, 3261–3272. [CrossRef]
82. Mitra, S.; Jaggi, B.; Ai, H.T. The effect of managerial stock ownership on the relationship between material internal control weaknesses and audit fees. *Rev. Account. Financ.* **2017**, *16*, 239–259. [CrossRef]
83. Li, H.; Zhang, X.; Zhao, Y. ESG and firm's default risk. *Financ. Res. Lett.* **2022**, *47*, 102713. [CrossRef]
84. Yan, K.; Chen, Z.; Wang, J.; Wang, P.; Liang, W. The power from folk monitoring: Leading officials' natural resources accountability audit (NRAA) and corporate ESG performance. *Financ. Res. Lett.* **2023**, *58*, 104575. [CrossRef]
85. Capelle-Blancard, G.; Petit, A. Every little helps? ESG news and stock market reaction. *J. Bus. Ethics* **2019**, *157*, 543–565. [CrossRef]
86. Alareeni, B.A.; Hamdan, A. ESG impact on performance of US S&P 500-listed firms. *Corp. Gov. Int. J. Bus. Soc.* **2020**, *20*, 1409–1428. [CrossRef]
87. Jabbour, C.J.C.; Seuring, S.; de Sousa Jabbour, A.B.L.; Jugend, D.; Fiorini, P.D.C.; Latan, H.; Izeppi, W.C. Stakeholders, innovative business models for the circular economy and sustainable performance of firms in an emerging economy facing institutional voids. *J. Environ. Manag.* **2020**, *264*, 110416. [CrossRef]
88. Porter, M.E. Towards a dynamic theory of strategy. *Strat. Manag. J.* **1991**, *12*, 95–117. [CrossRef]
89. Wang, Z.; Zhou, Y. Business model innovation, legitimacy and performance: Social enterprises in China. *Manag. Decis.* **2020**, *59*, 2693–2712. [CrossRef]