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Top Management Team Heterogeneity, Top Management Incentives, and ESG Performance: Evidence from Chinese Listed Companies

Shanshan Lyu [1], Mingzeng Yang [2] and Qincheng Zhang [2,*]

[1] College of Business and Accountancy, Our Lady of Fatima University, Manila 1440, Philippines; shanshanlyu2001@163.com
[2] School of Accountancy, Shandong University of Finance and Economics, Jinan 250014, China; 19938786@sdufe.edu.cn
* Correspondence: qinchengzhang@sdufe.edu.cn

Abstract: The challenge of balancing economic and social benefits has emerged as a critical issue for corporate sustainable development. Environmental, social, and governance (ESG) criteria are key considerations for enterprises aiming to enhance both social and economic benefits simultaneously. Based on the upper echelons theory, differences in cognitive foundations and values brought about by top management team heterogeneity can influence corporate decisions. Taking A-share listed companies in China from 2011 to 2022 as samples, we construct a two-way fixed-effects model by firm and year to explore the impact of top management team heterogeneity on corporate ESG performance, and we introduce top management incentives as a moderating variable to further analyze the underlying mechanisms. Our results demonstrate that the gender heterogeneity, functional background heterogeneity, and overseas background heterogeneity of top management teams have significant positive impacts on corporate ESG performance, and monetary compensation incentives and control incentives to top management teams play a positive moderating role, while equity incentives exhibits a negative moderating effect. These findings remain robust across alternative measures of corporate ESG ratings and monetary and control incentives, and through the SYS-GMM model test and instrumental variable approach to address endogeneity. This research contributes to the literature on corporate ESG by validating and extending the understanding of how top management team characteristics affect organizational outcomes, and it provides practical guidance for enhancing corporate ESG practices. The implications of this study suggest that to enhance corporate ESG performance, enterprises should prioritize the promotion of top management team heterogeneity and tailor their incentive mechanisms accordingly.

Keywords: top management team; heterogeneity; incentives; ESG performance

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1. Introduction

ESG is a comprehensive framework for evaluating the sustainable development of enterprises, which is divided into three aspects: environmental (E), social (S) and governance (G) [1]. In recent years, ESG has garnered significant attention from regulatory authorities [2,3], professional investment institutions [4,5] and listed companies [6,7], rapidly becoming a central focus in sustainable development research [8].

The concept of ESG was first officially introduced by the United Nations Global Compact in 2004. In 2006, the United Nations Principles for Responsible Investment (UN PRI) issued the Principles of Responsible Investment (PRI), aimed at encouraging major investment organizations globally to integrate ESG considerations into their investment decision-making processes and improve their sustainable investment management. Under the impetus of PRI, the concept of ESG began to gain momentum, and ESG investment principles were formally established. The ESG performance of an enterprise plays the

most important guiding role for investors and asset management institutions [9]. ESG ratings can mitigate the information asymmetry between investors and enterprises and help investors analyze the potential risks of enterprises [10]. In addition, ESG ratings can assist enterprises in developing their sustainability capabilities and attracting a greater number of sustainability-focused investors [11]. Therefore, ESG performance is profoundly consequential for the sustainable development of enterprises.

In China, ESG is a relatively new concept [12]. In recent years, a considerable number of publicly traded companies in China have started to take notice of their ESG performance and begun to disclose ESG information. However, there are more companies that regard ESG disclosure as a future plan and have not implemented it yet [13]. In view of this, China is constantly strengthening the institutional construction of ESG. In 2018, the China Securities Regulatory Commission (CSRC) revised and officially promulgated the Governance Standards for Listed Companies (revised version), which for the first time determined the basic framework and standards for environmental, social, and corporate governance (ESG) information disclosure [14]. In the same year, the Asset Management Association of China (AMAC) launched research on China's enterprise ESG system and green investment management standards (pilot), establishing the fundamental metrics for enterprise ESG performance management in China [15,16]. Since that milestone, China has formally recognized ESG performance as a benchmark indicator for evaluating the sustainability progress of publicly traded firms. The information disclosure, corporate management, strategic planning, and resource allocation activities of Chinese listed companies are significantly influenced by the incremental development of ESG awareness [17–19].

The top management team (TMT), serving as a pivotal role in corporate operations and strategic determinations, exerts a substantial effect on organizational effectiveness and developmental tactics [20,21]. In the past, the academic research on TMTs initially focused on the repercussions of the CEO's personal traits on business efficacy [22]. With the emergence of the upper echelons theory, the study of TMTs has become the focus of many studies [23,24]. Corporate executives have different personal characteristics, such as age, values, thinking patterns, educational experience and other background experience differences [20,25]. It is equally meritorious as to whether the diversity of personal traits of executives will affect business entities' ESG performance. Following the tenets of stakeholder theory, the stakeholders of enterprises come from many backgrounds. To secure enduring advancement, the top managers should not only focus on business performance but also pay attention to the interest demands of the many stakeholders [26]. In addition, based on Maslow's hierarchy of needs theory, top managers will pursue spiritual needs after meeting basic material needs [27], helping the company improve ESG performance in order to enhance their own reputation. The satisfaction of such needs is related to the top management incentive mechanism of enterprises. In addition to explicit monetary compensation incentives and equity incentives [28,29], more and more scholars have found that organizational resolutions are significantly swayed by the implicit incentive mechanism of executive control right [30]. In this context, it has significant practical value to study whether the top management incentive mechanism can really stimulate the enthusiasm of TMTs to promote corporate ESG performance.

Consequently, using A-share listed companies in China from 2011 to 2022 as samples, this paper constructs a two-way fixed-effects model by firm and year to investigate the influence of top management team heterogeneity on corporate ESG performance, as well as the moderating role played by top management incentives. The aim is to answer two key questions: Firstly, employing the upper echelons perspective, this study probes into whether corporate ESG performance is influenced by the heterogeneity of top management team characteristics, such as gender, functional background, and overseas background. Secondly, the incentive theory is employed to investigate whether ESG outcomes are positively moderated by the monetary compensation incentives, equity incentives, and control incentives of senior management.

The findings of this paper show that the gender heterogeneity, functional background heterogeneity, and overseas background heterogeneity of top management teams have significant positive impacts on corporate ESG performance, and monetary compensation incentives and control incentives to top management teams play a positive moderating role, while equity incentives exhibit a negative moderating effect. These findings remain robust across alternative measures of corporate ESG ratings and monetary and control incentives, and through the SYS-GMM model test and instrumental variable approach to address endogeneity. The implications of this study suggest that to enhance corporate ESG performance, enterprises should prioritize the promotion of top management team heterogeneity and tailor their incentive mechanisms accordingly.

The primary contributions of this research are summarized as follows: First, utilizing microdata from publicly traded companies in China, this study investigates the repercussions of TMT heterogeneity through the lens of ESG performance and theoretically analyzes and empirically tests the effects of TMT heterogeneity on business entities' ESG outcomes. Existing research mainly deals with the impact of top management team heterogeneity on business performance [31,32], innovation [33,34], corporate governance [35], and information disclosure [36,37]. Therefore, compared with the existing literature, this paper reveals the catalytic influence of TMT heterogeneity on firm ESG performance, enriches the research content on TMT heterogeneity and its economic consequences, and expands the investigation into determinants of firm ESG. Second, this paper conducts a theoretical examination alongside an empirical investigation into the buffering influence exerted by executive remuneration on the correlation between TMT heterogeneity and firm ESG. The existing research mainly explores the effects of executive incentives on corporate financial performance and market performance [38], operational efficiency [39], corporate strategy [40], corporate innovation [41], enterprise digitalization [42], and other aspects, but there is a lack of research on the interaction between executive motivation and team heterogeneity. By contrast, this paper explores how executive incentives moderate the impact of the heterogeneity of the top management team on ESG performance, further deepening the understanding of the relationship among TMT heterogeneity, top management incentives, and ESG performance. Thirdly, the research conclusions of this paper have important practical significance, providing clear enlightenment for enterprises to effectively improve ESG performance, helping enterprises to find a breakthrough point for improving ESG performance from the perspective of human resource allocation of the top management team, and adjusting the incentive mechanism of the top management team to support the realization of ESG strategic goals.

2. Literature Review

2.1. Top Management Team (TMT) Heterogeneity

Since the proposal of the upper echelons theory by Hambrick and Mason [43], there has been extensive research on the characteristics of TMTs. The upper echelons theory holds that internal and external environments will shape the cognitive basis of top managers. Different cognitive foundations and values enable corporate executives to make distinct strategic decisions when faced with similar situations, thereby influencing corporate actions. Additionally, the theory highlights the observability of executives' cognition and values through demographic characteristics, such as gender and functional background. This exerts a substantial propelling influence on the advancement of TMT research.

In terms of gender heterogeneity, some studies suggest that a positive association exists between the percentage of female executives and business performance [31,44–46]. This may be because the gender heterogeneity of TMTs can promote corporate cohesion, and female executives are better able to break down communication barriers and enhance the cohesiveness of TMTs [32]. However, some scholars argue that gender heterogeneity within the TMT might lead to increased conflict, potentially resulting in a negative correlation with corporate performance [21]. In addition, Shrader et al. [47] and Kochan et al. [48] found no significant link between the ratio of female board members and business performance. As

for corporate governance, Adams and Ferrea [35] found that TMT gender heterogeneity improves the efficiency of corporate governance by enabling directors to better play their supervisory role. As for corporate innovation, Lee and Chung [33] believe that women can facilitate the exchange of ideas and resources, thereby promoting innovation through an increase in the share of female managers. Regarding carbon information disclosure, some studies have shown that gender diversity among top management improves the quality of voluntary carbon emissions disclosures [36] and accounting disclosure quality [37].

In regard to functional background heterogeneity, Finkelstein et al. [49] found that managers from production, technology, or R&D departments pay more attention to technological improvement and innovative breakthroughs. Fung [50] believed that functional background differences exert a beneficial influence on performance after mergers and acquisitions. Berger et al. [51] suggested that TMTs with high functional background heterogeneity have fewer internal conflicts.

As for overseas background heterogeneity, some studies suggest that the overseas background of executives is an important factor for companies seeking to expand into international markets. Sambharya [52] found that top management teams having overseas backgrounds promotes the internationalization process of enterprises. Executives with overseas backgrounds possess deeper insight into overseas markets and are consequently predisposed to prosper in international operations. Herrmann and Datta [53] found that executives with overseas backgrounds have more advanced management concepts and can grasp the development trends of international advanced technologies more keenly, which bears substantial value for enterprises in the initial stage of internationalization. According to Filatotchev et al. [54], top management with overseas experience can increase export performance. Fu et al. [34] argued that overseas-returned executives play a considerable part in advancing corporate creativity and inventive capabilities, and increased investment in Research and Development serves as a critical pathway for overseas-returned executives to influence corporate innovation.

2.2. Influencing Factors of Corporate ESG Performance

Research on the determinants affecting corporate ESG performance can be categorized into two perspectives: wide-angle and close-up. From the wide-angle viewpoint, the determinants of ESG performance can be categorized into four aspects: politics, economy, culture, and law. From a political perspective, scholars believe that countries with higher levels of corruption, less freedom of citizens, and higher unemployment rates have poorer ESG performance [55–57]. Economically, nations with advanced economic development, market-driven financial frameworks, and established ESG indices tend to exhibit superior ESG performance [55,56]. In terms of culture, scholars have focused on power distance, harmony, equality, autonomy, and other cultural factors, finding that ESG performs better in areas with small power distance, and high degree of harmony, equality, and autonomy [56,58]. In terms of the origin of law, some scholars have found that the ESG level of countries with a case law system is lower than that of countries with a civil law system [59].

From the close-up viewpoint, the factors that affect corporate ESG performance can be approximately categorized into the corporate idiosyncrasies and the attributes of senior executives. With regard to corporate idiosyncrasies, some scholars believe that cross-listing, media attention, and digitization will affect corporate ESG. After cross-listing, the company will improve its ESG performance and show its strength to investors, thereby mitigating any disadvantages associated with being an outsider and attracting the interest of foreign investors. Therefore, cross-listed companies pay more attention to ESG performance [57,60–62]. Borghesi et al. [63] found that increased media attention can enhance ESG performance. The enterprise digital transformation emerging in recent years can improve ESG performance [64–66]. Viewed from the senior executives' characteristics, scholars have found that younger chief executive officers, female chief executives, CEOs who make donations to various causes, and

CEOs with frequent media appearances invest more in ESG initiatives and induce better ESG performance [63].

2.3. Top Management Incentives

Research on top management incentives has evolved from the single incentive method and has expanded continuously. With the deepening of research and the development of equity incentives and control right incentives, the methods of top management incentives have been explored more deeply, and three forms of explicit incentives and implicit incentives have been gradually divided, namely, monetary incentives, equity incentives, and control right incentives.

First, in terms of monetary compensation incentives, Jensen and Meckling [67] pointed out that reasonable compensation design can greatly improve the work enthusiasm of managers, thus being conducive to the business performance of enterprises. Based on the existing literature and agency theory, Al Farooque et al. [68] found that increasing compensation incentives is an effective means to improve business performance. Savaşer and Şişli-Ciamarra [38] empirically analyzed the influence of monetary compensation incentives on firm performance. They found that, in the long and short term, monetary compensation incentives exert a favorable influence on the financial and market performance of enterprises. The empirical study by Ikram et al. [69] found that CEO compensation structure influences firm corporate social responsibility (CSR) performance.

Second, in regard to equity incentives, Jensen and Meckling [67] pointed out that equity incentives for executives can reduce perquisite consumption, ease the principal–agent relationship, and increase their enthusiasm to make profits for the company. Aboody et al. [70] pointed out that equity incentives could easily lead to financial fraud by senior executives and damage business performance. La Porta et al. [71] drew a conclusion about the nonlinear nexus between equity incentives and organizational effectiveness. He believes that corporate performance will fluctuate relative to the shareholding ratio's range. Third, with respect to control right incentives, compared with explicit incentives, there are relatively few studies on executive control right incentives at present, which need to be further studied and supplemented. Zahra et al. [72] believe that separation between CEO and chairman positions in enterprises can reduce the control right of executives, which is more beneficial to the improvement of governance efficiency. However, more scholars reported that corporate performance is positively correlated with executive control through theoretical and empirical analysis in subsequent studies. Lerner and Wulf [73] analyzed American enterprises and found that CEO control right incentives can positively promote corporate technological innovation. Many researchers measure executive control by the level of perquisite consumption of senior executives. Rajan and Wulf [39] found that executive perquisite consumption could improve enterprise efficiency.

In conclusion, as a result of the separation between shareholder ownership and managerial control, the TMT holds the control right of the enterprise, which is of paramount significance for the progression of the company. With the increasing complexity of the external environment, the role of the TMT becomes even more critical for the enterprise. However, there is a scarcity of studies that analyze the influences of TMT heterogeneity on corporate ESG standing. It is the intention of this paper to compensate for the deficiency of current research by studying the effects of TMT heterogeneity on corporate ESG performance from an empirical perspective and investigating the moderating effects of top management incentives on how TMT heterogeneity influences corporate ESG performance.

3. Hypotheses Development

3.1. Top Management Team (TMT) Heterogeneity and Corporate ESG Performance

3.1.1. Gender Heterogeneity and Corporate ESG Performance

It is increasingly clear that women are making significant contributions to enterprises as they assume more roles in corporate management and hold leadership positions. Researchers are also exploring the gender composition of TMTs. Disparities between

genders lead to different traits, cognition, and values among male and female executives, which results in behavioral differences [74–76]. The upper echelons perspective holds that the gender traits of senior leadership will have an impact on their business decisions in the enterprise.

First, in terms of ESG awareness, research by Setó-Pamies [77] showed that, with the participation of female executives, companies will more actively develop ESG strategies and pay attention to sustainable development. Wang and Coffey [78] demonstrated that companies are more active in corporate social responsibility (CSR) activities when they have women on their boards. Ibrahim and Angelidis [79] discovered that, compared with male directors, female directors have a stronger orientation toward social responsibility in companies. Gillgan [80] pointed out that women have their own unique ways to solve ethical dilemmas, which are significantly different from the male thought process. Females tend to be more predisposed toward contemplating particular ethical dilemmas [81]. Secondly, in terms of identifying stakeholders, women are generally more sensitive, have stronger affinity, and place greater emphasis on reconciling the relationship among all stakeholders. Therefore, different stakeholder groups with different needs can be identified and addressed by TMTs with gender differences through ESG strategies [82]. For instance, women managers may be more attuned to the requirements of consumers for green innovations [74]. Thirdly, as for teamwork, female executives are better at communicating and exchanging ideas among their colleagues and maintain stronger relationships compared to male executives. By virtue of their exceptional abilities to collaborate and interact with others, female executives can enhance group cohesiveness through efficient communication, reducing conflict and delay [75], and thus improve the efficiency of enterprises' ESG behaviors and thereby promote enterprises' ESG performance. In addition, in terms of decision-making diversity, the participation of female executives in corporate decision-making processes can better achieve corporate decision-making diversity, so as to assess environmental, social, and governance risks and opportunities more comprehensively and accurately.

According to the aforementioned analysis, in the current male-dominated TMTs, the gender heterogeneity brought about by the entry of female executives improves the ESG awareness of TMTs and the capacity to identify the requirements of stakeholders, and it increases the cohesion of TMTs and decision-making diversity. This may positively affect the implementation of corporate ESG strategies, thus improving the performance of corporate ESG. Therefore, this study posits the subsequent hypothesis:

Hypothesis 1. *The gender heterogeneity of the TMT has a significant positive influence on corporate ESG performance.*

3.1.2. Functional Background Heterogeneity and Corporate ESG Performance

TMT members typically hold a variety of positions and assume different functions prior to becoming top managers, which together constitute their functional background. Their functional backgrounds exemplify TMT members' mastery of knowledge from different functions. Their functional backgrounds significantly influence the perspectives through which senior management team members analyze problems and make decisions [20]. TMTs with high functional background heterogeneity can handle complexity more effectively [83]. As the heterogeneity of explicit functional backgrounds increases, the knowledge, vision, experience, and capabilities that the entire TMT can use in decision making will also be expanded [84]. TMT members bring distinct perspectives and their previous functional experience to corporate management, and they have different priorities for the factors that must be considered in the future of the company. Therefore, TMTs with more members from different functional backgrounds will consider the development prospects of the company at all levels more comprehensively [85]. On the issue of sustainable development, executives with different functional backgrounds will consider issues more holistically,

and top managers will place heightened emphasis on the enterprise's ESG performance to safeguard the long-term benefits of the enterprise.

According to information and decision theory, information serves as a crucial foundation for making decisions [86]. In the decision-making process, having more information and different points of view contributes to exhaustive insight into the problem and its more effective resolution [87]. First of all, TMTs with diverse functional backgrounds can provide cognition and understanding of the same issue from different functional perspectives, forming information complementarity and resource sharing, which is conducive to sustainable development of enterprises [88]. Secondly, the advantages of knowledge and experience brought by teams with highly heterogeneous functional backgrounds make TMTs confident to address the challenges they face [89]. TMTs with high heterogeneity can adapt to changes in the external environment and cope with external pressures. When enterprises encounter drastic changes in the external environment and ESG development pressures, teams with high heterogeneity will be more experienced in dealing with these problems and make rational decisions to mitigate the pressure on ESG performance brought by stakeholders. Moreover, executives with different functional backgrounds can strengthen mutual supervision. Executives with certain functional backgrounds overestimate the importance of their field. In the long run, a TMT with a homogeneous background will lead to the abnormal development of the enterprise. Meanwhile, a TMT with different functional backgrounds, based on different perspectives, will play a role in supervising the behaviors that damage ESG performance.

It becomes evident that the functional backgrounds of TMTs will affect their value orientation and behavior choices, alongside the ESG achievement of companies. Functional background heterogeneity makes enterprises more adaptable to environmental changes and alleviates the pressure on ESG performance brought by stakeholders. Functional background heterogeneity can promote information complementarity and resource sharing among TMT members and refine the decision-making process, leading to superior ESG performance within the enterprise. Consequently, this paper formulates the subsequent hypothesis:

Hypothesis 2. *The functional background heterogeneity of the TMT has a significant positive influence on corporate ESG performance.*

3.1.3. Overseas Background Heterogeneity and Corporate ESG Performance

The overseas background of upper management will have an impact on their cognitive styles and value concepts, affecting their understanding and attitude toward corporate ESG. On the one hand, compared with managers who have studied and worked solely within China, executives possessing international study or work experience are more prone to embrace and acknowledge the principles of ESG [90]. Specifically, ESG is still a relatively new concept in China, while foreign scholars started to study ESG earlier. Developed countries abroad have integrated ESG investment as a primary strategy, whereas both academic research and market practice of ESG in China are in nascent stages. As a result, executives with overseas backgrounds have received more training in ESG concepts and investment approaches than their counterparts. On the other hand, top managers with overseas backgrounds are more familiar with cutting-edge practices in the field of ESG abroad [90]. Since European and American companies have been relatively mature in ESG performance practices, executives with overseas backgrounds possess a deeper understanding of overseas companies' operating models and ESG practice paths. Therefore, executives with overseas backgrounds will place heightened emphasis on the appeals of different stakeholders, raise more concerns about community activities and social welfare, and reduce tax avoidance activities.

According to the upper echelons theory, the thinking concept, knowledge structure, and psychological preference of top managers contribute significantly to the strategic decision-making of enterprises, which then influences the production and performance of

enterprises. Executives with overseas experience can enrich a company's overall knowledge system [91]. Therefore, executives with overseas backgrounds can apply ESG thinking concepts and management methods generated from overseas experiences to the management practices of local enterprises, providing enterprises with unique human capital, thus aiming to augment their ESG performance and improve their reputation [92].

In addition, from the perspective of social capital, executives with overseas backgrounds have richer international social relations and broader information networks. According to the social exchange theory, the key to the value of social capital lies in the exchange of important information in social networks, and executives with overseas backgrounds usually have larger social networks, thus bringing greater information advantages [93]. Therefore, returnee executives play a crucial role in obtaining more accurate and timelier ESG information, as well as understanding and addressing the needs of stakeholders more effectively, thus improving companies' ESG ratings.

However, seen through the lens of the matching relationship between the traits of overseas talents and the domestic environment, the role played by overseas talents in emerging economies may be affected by the institutional structure and the market differences of strategic factors. Executives with overseas backgrounds may lack correct judgment of new changes in the domestic environment and thus cannot integrate with the local environment, resulting in the occurrence of the phenomenon of non-acclimatization [94]. Therefore, the more similar the ratio of members with and without international experience within the top management team and the greater the heterogeneity of overseas backgrounds, the better the optimization of the knowledge base and social capital of the TMT and satisfaction of the needs of multi-stakeholders, thereby positively impacting corporate ESG performance. Taking into account the prior scrutiny, this paper formulates the subsequent hypothesis:

Hypothesis 3. *The overseas background heterogeneity of the TMT has a significant positive influence on corporate ESG performance.*

3.2. The Moderating Role of Top Management Incentives

3.2.1. Monetary Compensation Incentives

Under the modern corporation system, the separation of ownership and management control creates a divergence between the goals of owners and operators, resulting in agency problems [68]. When there is a certain deviation between the degree of effort of senior executives and the compensation they receive, it may cause senior executives to ignore the interests of shareholders, potentially leading to self-serving behaviors. Executives may pursue their own interests as much as possible while creating wealth for the company, thereby harming shareholder interests. Agency theory points out that appropriate incentive policies will help to alleviate the information asymmetry and then ease the contradiction between management and shareholders, promote the convergence of interests between the two, and narrow the difference between the objectives of owners and operators [95]. This will be conducive to the implementation of corporate ESG. In addition, based on Maslow's demand theory, executives may pursue their spiritual needs [96], namely, personal reputation and social sense of achievement, after receiving higher monetary compensation incentives in the enterprise. At this point, executives are likely to make substantial investments in the company's ESG to enhance their social standing and influence. In the study of monetary compensation incentives, most scholars also agree that executive monetary compensation incentives serve a constructive function in advancing corporate social responsibility. Drawing from the aforementioned analysis, the subsequent hypothesis is posited in this paper:

Hypothesis 4. *Monetary compensation incentives exert a beneficial moderating influence on the relationship between TMT heterogeneity and corporate ESG performance.*

3.2.2. Equity Incentive

Viewed through the lens of agency theory, as the agent of the firm, when the firm gives equity incentives to a senior executive, he or she can become the owner of the residual value of the enterprise as a shareholder [97]. This can not only mitigate the moral hazard associated with executive behaviors and decrease agency costs but also enhance executives' sense of belonging and loyalty. This is because the essence of equity incentives is to align the goals of executives with those of shareholders [98]. Any social or environmental activity that a company takes part in will incur additional costs, and these additional costs may diminish the financial value of the enterprise. Based on the shareholder primacy theory, because a large amount of capital investment is required, even excessive investment will be triggered, and ESG activities are a kind of loss of shareholders' equity, which goes against the maximization of benefits pursued by shareholders [99]. Therefore, shareholders are not inclined to make investment behaviors to promote ESG performance, so executives are very likely to be unwilling to devote themselves to improving ESG performance after receiving equity incentives.

In addition, under the assumption of the rational man in neoclassical economics, the pursuit of expected benefits of executives will affect their behaviors [100]. Executives will obtain information that can affect the expected earnings of enterprises through various means, weighing the opportunity costs. Executives will take actions only if their expectations of steady earnings are met. However, increasing ESG investment does not have an immediate effect, which makes it difficult for executives to form stable expectations of future benefits [101]. Therefore, compared with promoting corporate ESG performance, senior executives are more inclined to grasp the current benefits and avoid losses caused by the uncertain development of the company. Equity incentives may not be conducive to the improvement of corporate ESG performance. Considering the aforementioned discussion, the below hypothesis is proposed:

Hypothesis 5. *Equity incentives impose a detrimental moderating impact on the relationship between TMT heterogeneity and corporate ESG performance.*

3.2.3. Control Right Incentives

There are two types of top management incentives: one is explicit incentives, including monetary incentives and equity incentives, and the other is implicit incentives, such as control right incentives [102]. As a kind of implicit incentive mechanism, the basic logic of control right incentives is as follows: the right of control can satisfy the needs of executives for self-realization, power, and material interests, beyond regular reward incentives. According to the logic of control allocation, management control is given by the board of directors. The board of directors can restrict the self-interested behaviors of executives by granting management control or not, so as to make the decisions made by executives more rational in anticipation and facilitate the enhancement of corporate efficiency on the basis of ensuring the interests of shareholders. From Maslow's hierarchy of needs theory, senior executives pursue needs such as dignity, faith, and job satisfaction [96], while the right of control can satisfy their higher-level needs. A representative measure of the right of control is CEO–chairman duality. The separation of the two positions allows the directorate to closely supervise and control the senior executive team, placing greater performance pressure on executives [103]. In order to improve short-term performance, investments in ESG may be reduced, leading to underinvestment in ESG. On the contrary, CEO–chairman duality weakens the board's and major shareholders' control over ESG strategies [103], allowing top management teams to more effectively exercise their discretion in making and implementing ESG strategic decisions. Drawing from the aforementioned analysis, the subsequent hypothesis is posited:

Hypothesis 6. *Control right incentives exert a beneficial moderating influence on the relationship between TMT heterogeneity and corporate ESG performance.*

3.3. Theoretical Model

The foregoing analytical insights culminate in a conceptual framework (depicted in Figure 1), elucidating the impact of TMT heterogeneity on corporate ESG performance. The constituents of this foundational model encompass TMT heterogeneity, corporate ESG performance, and top management incentives. Transparent interconnectedness is observable among these model components.

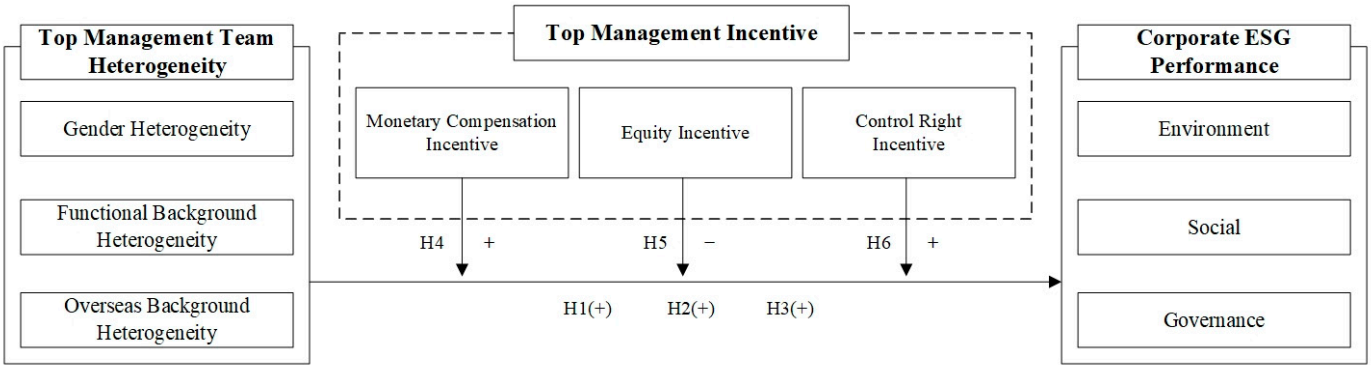

Figure 1. Theoretical model.

4. Research Design

4.1. Regression Models

This paper adopts panel data, which have the two dimensions of firm and year. In order to avoid the estimation bias caused by the unobservable effects of firm and year, this paper adopts a two-way fixed-effects model (TWOFIX) with the effects of firm and year [104]. Since the sample firms in this paper changed their industrial attributes during the sample period, in order to make the conclusion more robust, this paper also controls the industry fixed effects. In order to test the impact of TMT heterogeneity on corporate ESG performance, this paper establishes the following model (1) by referring to the research of Hambrick et al. [21]:

$$ESG_{i,t} = \alpha_0 + \alpha_1 TMTH_{i,t} + \partial X_{i,t} + \Sigma Year + \Sigma Industry + \Sigma Firm + \varepsilon_{i,t} \quad (1)$$

To test the moderating role of top management incentives, this study adds *TMI* into model (1) and establishes the following model (2):

$$ESG_{i,t} = \beta_0 + \beta_1 TMTH_{i,t} + \beta_2 TMI_{i,t} + \beta_3 TMTH_{i,t} \times TMI_{i,t} + \partial X_{i,t} + \Sigma Year + \Sigma Industry + \Sigma Firm + \varepsilon_{i,t} \quad (2)$$

In models (1) and (2), subscript i and subscript t represent the enterprise and year, respectively, and the explained variable *ESG* represents corporate ESG performance. The explanatory variable *TMTH* represents TMT heterogeneity and the moderating variable *TMI* represents top management incentives. $X_{i,t}$ represents a series of characteristic variables at the firm level, which are used to control the impact of initial characteristic differences of enterprises on the regression results, including: firm size, financial leverage, cash flow, return on assets, growth rate, listed years, ownership concentration, board size, and ratio of independent directors. $\Sigma Firm$, $\Sigma Year$, and $\Sigma Industry$ represent the firm fixed effects, time fixed effects, and industry fixed effects, respectively, which are used to control the interference of inherent characteristics of enterprises that do not change with time and macro factors in different years on the model estimation. $\varepsilon_{i,t}$ is the random disturbance term. In the specific empirical analysis, in order to exclude the influence of heteroscedasticity and serial correlation on the regression results, this paper adjusts the standard errors of the regression coefficients by clustering at the enterprise level. In measurement model (1), this paper focuses on the estimated coefficient α_1, which describes the actual impact of TMT heterogeneity on corporate ESG performance. In measurement model (2), this

paper focuses on the estimated coefficient β_3, which describes the moderating effect of top management incentives on the relationship between TMT heterogeneity and corporate ESG performance.

4.2. Main Variables

4.2.1. Dependent Variable

The dependent variable in the regression models is corporate ESG performance. We chose ESG scores in the Bloomberg database to quantify the ESG performance of enterprises. The score consists of ESG indicators from three different dimensions, namely, environmental (E), social (S) and governance (G). The indicators of each dimension are composed of various sub-indicators. The detailed indicators of the environmental dimension include environmental disclosure, pollution discharge, energy consumption, sewage discharge, waste management, environmental penalties, sustainable operation investment, sustainable operation policy, and so on. The detailed indicators of the social dimension include employee characteristics, employee diversity, gender pay gap, employee training, safety, supply chain management, community construction expenditure, social responsibility policy, and so on. The detailed indicators of the governance dimension include the board and senior executive diversity, board meeting frequency, the audit committee, the nomination committee, the activities of board and executives, shareholders' rights and interests, and so on. Below the second-level markers for each aspect are 120 meticulous lower-level indices that constitute the scoring benchmark [105,106]. The index system extensively, objectively, and comprehensively provides the environmental, social, and governance (ESG) performance relevant to different stakeholders.

4.2.2. Independent Variable

TMT heterogeneity (*TMTH*) serves as the independent variable. Gender, functional background, and overseas background differences among TMT members are used to quantify *TMTH*. Drawing on Blau [107], the Herfindahl–Hirschman Index (HHI) was computed for three types of heterogeneity within the top management team (*TMT*): gender heterogeneity (denoted as Hgen), functional background heterogeneity (denoted as Hfun), and overseas background heterogeneity (denoted as Hoversea). A higher HHI value signifies a more TMT heterogeneous, and vice versa.

4.2.3. Moderator Variables

In this study, the moderator element is top management incentives (denoted as *TMI*), which is used to assess how TMT heterogeneity influences corporate ESG performance under varying incentive mechanisms. This study divides the top management incentives (*TMI*) into three aspects: monetary compensation incentives (denoted as Salary), equity incentives (denoted as Equity), and control rights incentives (denoted as Control). Following the study conducted by Lewellen et al. [108], the natural logarithm of the sum of the salaries of the top three highest-paid executives is used to measure the compensation incentives. The proportion of shares held by senior executives to the total share capital is utilized as an indicator of the equity incentives. Referring to Zahra et al. [72], CEO–chairman duality is selected to measure the control rights incentives.

4.2.4. Control Variables

The control variables included in $X_{i,t}$ are firm size, financial leverage, cash flow, return on assets, growth rate, listed years, ownership concentration, board size, and the ratio of independent directors. In addition, this paper also controls for year fixed effects, industry fixed effects, and firm fixed effects.

Table 1 provides details on how the variables are constructed and operationalized.

Table 1. Variable definitions.

Variable	Explanation	Definition
ESG	ESG score	ESG composite score in Bloomberg database
E	Environmental score	Environmental score in Bloomberg database
S	Social score	Social score in Bloomberg database
G	Governance score	Governance score in Bloomberg database
Hgen	Gender heterogeneity	Herfindahl–Hirschman coefficient, gender: 1 = male, 0 = female
Hfun	Functional background heterogeneity	Herfindahl–Hirschman coefficient, functional background: 1 = Production, 2 = R&D, 3 = Design, 4 = Human resources, 5 = Management, 6 = Marketing, 7 = Finance, 8 = Law
Hoversea	Overseas background heterogeneity	Herfindahl–Hirschman coefficient, overseas background: 1 = Working abroad, 2 = Studying abroad, 3 = No overseas background
Salary	Compensation incentives	The natural logarithm of the sum of top three highest-paid executives' salaries
Equity	Equity incentives	Total shares owned by the manager divided by firm total outstanding shares
Control	Control right incentives	A dummy variable, the value is 1 when a CEO simultaneously chairs the board, and 0 otherwise.
Size	Firm size	The natural logarithm of total assets at the fiscal year end
Lev	Financial leverage	The proportion of total liabilities to total assets
Cfo	Cash flow	The proportion of net cash flow from operations to total assets
ROA	Return on assets	The proportion of net income to total assets
Growth	Growth rate	The proportion of operating income changes to operating income in the previous period at every year end
LnAge	Listed years	The natural logarithm of the firm's listed years plus one
Top1	Ownership concentration	The shareholding proportion of the firm's largest shareholder
Board	Board size	The natural logarithm of the total number of board members
Indep	Ratio of independent directors	The ratio of number of independent directors to number of directors on the board
Year	Year dummy variable	Year fixed effects
Industry	Industry dummy variable	Industry fixed effects, based on guidelines for the industry category of Chinese listed firms in 2012
Firm	Firm dummy variable	Firm fixed effects

4.3. Sample and Data

As a consequence of the 2008 global financial downturn, the yearly financial statements of Chinese publicly traded firms in 2009 and 2010 lacked stability. At the same time, taking into account the accessibility of ESG performance scores, the analysis includes Chinese entities with A-shares traded publicly from 2011 through 2022, serving as our examination sample. In order to safeguard the precision of the data, we applied the following sequential screening process: (1) firms lacking ESG ratings in the Bloomberg database were excluded; (2) financial companies were excluded; (3) companies designated as ST and *ST (indicating special treatment due to financial distress) were removed; and (4) publicly traded firms with missing financial information were excluded. In order to eliminate the effect of extreme values, all variables were winsorized up and down by 1%. After applying these criteria, we obtained 5879 valid samples. The score data of corporate ESG performance involved in this study are from the Bloomberg database, and the financial data are from the CSMAR database.

5. Empirical Testing

5.1. Descriptive Statistics

Table 2 illustrates the summary statistics for the variables under investigation in the study. In the Bloomberg database, ESG scores ranged from 0 to 100. The mean and median ESG scores of the samples in this paper were 29.716 and 28.559, respectively, indicating that the ESG performance of Chinese manufacturing firms needs to be improved. The standard deviation of ESG scores was 9.695, indicating substantial variation in ESG performance among different firms in China. The mean values of heterogeneity in gender, functional background, and overseas background of TMT were 0.192, 0.673, and 0.080, respectively. This suggests that gender and overseas background heterogeneities are relatively high, while functional background heterogeneity is relatively low. In terms of monetary compensation incentives (*Salary*), the lowest recorded figure was 11.791, whereas the peak reached 18.049, with a standard deviation of 0.757, suggesting significant disparity in the remuneration packages of executives across Chinese listed companies. Viewed from the standpoint of equity incentives (*Equity*), the mean value was 0.041, the standard deviation was 0.105, the minimum value was 0, and the maximum value was 0.800, indicating that the intensity of equity incentives of different companies is also significantly different. It becomes apparent that the intensity of equity incentives varies among different listed companies. For control right incentives (*Control*), the average measurement of CEO–chairman duality was 0.234, indicating that about 23.4% of the companies in the sample had CEO–chairman duality.

Table 2. Summary statistics.

Variable	Obs.	Mean	S.D.	Minimum	Median	Maximum
ESG	5879	29.716	9.695	8.678	28.559	67.639
Hgen	5879	0.192	0.180	0.000	0.219	0.500
Hfun	5879	0.673	0.101	0.278	0.694	0.815
Hoversea	5879	0.080	0.143	0.000	0.000	0.490
Salary	5879	14.635	0.757	11.791	14.578	18.049
Equity	5879	0.041	0.105	0.000	0.000	0.800
Control	5879	0.234	0.423	0.000	0.000	1.000
Size	5879	22.881	1.211	20.379	22.754	26.059
Lev	5879	0.448	0.194	0.060	0.453	0.908
Cfo	5879	0.061	0.066	−0.114	0.057	0.242
ROA	5879	0.046	0.063	−0.193	0.038	0.216
Growth	5879	0.149	0.340	−0.471	0.099	2.074
LnAge	5879	2.469	0.550	1.099	2.565	3.296
TOP1	5879	0.353	0.150	0.087	0.335	0.770
Board	5879	2.327	0.236	1.792	2.303	2.944
Indep	5879	0.381	0.074	0.250	0.364	0.600

5.2. Correlation Analysis

Table 3 reports the Pearson correlation coefficients between the main variables. It can be seen from the second column that the Pearson correlation coefficients of ESG performance (*ESG*) with gender heterogeneity (*Hgen*), functional background heterogeneity (*Hfun*), and overseas background heterogeneity (*Hoversea*) are 0.614, 0.634, and 0.660, respectively, and all exhibit a significant positive correlation at the level of 1%. This initially indicates that TMT heterogeneity has a positive impact on the ESG performance of enterprises, which is consistent with the hypothesis expectation. However, the specific impact needs to be explained by follow-up studies. At the same time, the maximum value of the Pearson correlation coefficient between variables is 0.787, which is lower than 0.8, indicating that there is no multicollinearity problem. However, considering that most of the correlation coefficients are between 0.5 and 0.7, this paper further uses the variance inflation factor (VIF) to verify the multicollinearity. It can be seen from Table 4 that the maximum value of the test value is 4.89, which is all less than 5, indicating that there is no

multicollinearity among the variables, which can be included in the regression model for quantitative analysis.

Table 3. Pearson correlation analysis.

	ESG	Hgen	Hfun	Hoversea	Size	Lev	Cfo	ROA	Growth	LnAge	TOP1	Board	Indep
ESG	1												
Hgen	0.614 ***	1											
Hfun	0.634 ***	0.619 ***	1										
Hoversea	0.660 ***	0.701 ***	0.706 ***	1									
Size	0.736 ***	0.572 ***	0.606 ***	0.655 ***	1								
Lev	0.653 ***	0.549 ***	0.603 ***	0.648 ***	0.787 ***	1							
Cfo	0.636 ***	0.635 ***	0.594 ***	0.661 ***	0.612 ***	0.516 ***	1						
ROA	0.600 ***	0.655 ***	0.612 ***	0.667 ***	0.568 ***	0.408 ***	0.766 ***	1					
Growth	0.587 ***	0.631 ***	0.615 ***	0.678 ***	0.611 ***	0.593 ***	0.641 ***	0.735 ***	1				
LnAge	0.703 ***	0.574 ***	0.567 ***	0.615 ***	0.731 ***	0.690 ***	0.605 ***	0.545 ***	0.534 ***	1			
TOP1	0.628 ***	0.594 ***	0.598 ***	0.617 ***	0.664 ***	0.629 ***	0.627 ***	0.630 ***	0.595 ***	0.595 ***	1		
Board	0.645 ***	0.578 ***	0.617 ***	0.648 ***	0.675 ***	0.665 ***	0.582 ***	0.545 ***	0.576 ***	0.673 ***	0.595 ***	1	
Indep	0.597 ***	0.628 ***	0.610 ***	0.657 ***	0.601 ***	0.583 ***	0.621 ***	0.633 ***	0.605 ***	0.555 ***	0.626 ***	0.565 ***	1

Note: *** indicates significance at the 0.1% level.

Table 4. Variance inflation factor test.

Variable	VIF	1/VIF
Hgen	2.59	0.385957
Hfun	2.61	0.382762
Hoversea	3.44	0.290436
Size	4.26	0.234731
Lev	4.63	0.215915
Cfo	3.91	0.255824
ROA	4.89	0.189155
Growth	3.05	0.327742
LnAge	2.91	0.343958
TOP1	2.58	0.387751
Board	2.60	0.384885
Indep	2.42	0.413000
Mean VIF	3.00	

5.3. Test Results of Hypotheses

5.3.1. Top Management Team (TMT) Heterogeneity and Corporate ESG Performance

This paper uses a two-way fixed-effects model (TWOFIX) with the effects of firm and year to test the proposed hypotheses. Table 5 shows the outcomes of the regression analysis probing the effect of gender heterogeneity on ESG performance. Column (1) in Table 5 presents that the gender heterogeneity of TMTs has a promoting effect on corporate ESG performance at the 1% significance level ($\beta = 1.529$, $t = 3.222$). In Table 5, columns (2), (3), and (4) are the regression results when the three different dimensions of environment (E), society (S), and governance (G) are used as dependent variables. Column (2) in Table 5 reports that gender heterogeneity has no significant impact on corporate environmental performance ($\beta = 0.764$, $t = 1.292$). Column (3) in Table 5 reports that gender heterogeneity has a forward influence on social performance at the 1% significance level ($\beta = 3.541$, $t = 4.808$). Column (4) in Table 5 reports that gender heterogeneity has a forward influence on corporate governance performance at the 1% significance level ($\beta = 1.324$, $t = 3.590$). Based on the above results, we find that the gender heterogeneity of TMTs can improve corporate ESG performance as a whole. In addition, gender heterogeneity promotes corporate ESG performance mainly by promoting corporate performance in social responsibility and governance. Therefore, it is verified that Hypothesis 1 is valid.

Table 5. Gender heterogeneity and corporate ESG performance.

	(1)	(2)	(3)	(4)
	ESG	**E**	**S**	**G**
Hgen	1.529 ***	0.764	3.541 ***	1.324 ***
	(3.222)	(1.292)	(4.808)	(3.590)
Size	1.697 ***	2.181 ***	1.823 ***	0.740 ***
	(16.993)	(17.773)	(11.700)	(9.577)
Lev	−1.886 ***	−2.764 ***	−4.274 ***	1.749 ***
	(−3.253)	(−3.850)	(−4.636)	(3.785)
Cfo	1.563	3.400 *	2.857	−1.385
	(1.025)	(1.772)	(1.200)	(−1.126)
ROA	2.989	0.993	5.047 *	0.436
	(1.628)	(0.431)	(1.759)	(0.302)
Growth	−0.837 ***	−0.849 **	−1.298 ***	−0.341 *
	(−3.068)	(−2.544)	(−3.011)	(−1.652)
LnAge	0.943 ***	0.256	0.875 ***	2.097 ***
	(5.357)	(1.146)	(3.187)	(15.345)
TOP1	1.223 **	1.254 *	2.060 **	0.977 **
	(2.014)	(1.740)	(2.117)	(2.118)
Board	0.991 ***	1.212 ***	1.699 ***	0.017
	(2.737)	(2.659)	(3.093)	(0.059)
Indep	0.034	−0.017	−0.303	−1.033
	(0.030)	(−0.012)	(−0.172)	(−1.121)
_cons	−26.933 ***	−47.659 ***	−31.729 ***	22.321 ***
	(−12.426)	(−17.928)	(−9.339)	(13.406)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes
N	5879	5879	5879	5879
Adj.R^2	0.251	0.240	0.136	0.195

Note: t-statistics are enclosed in brackets, with *** indicating significance at the 0.1% level, ** at the 1% level, and * at the 5% level.

Table 6 shows the outcomes of the regression analysis probing the effect of functional background heterogeneity on corporate ESG performance. The first column of Table 4 reports that the functional background heterogeneity of TMTs has a promoting influence on ESG performance at the 1% significance level (β = 3.055, t = 3.726). When examining the environmental, social, and governance aspects as dependent variables, the corresponding results are showcased in columns (2), (3), and (4) of Table 6, respectively. Column (2) in Table 6 reports that functional background heterogeneity has a forward effect on the environmental performance of the firm at the significance level of 1% (β = 4.272, t = 4.402). Column (3) in Table 6 reports that the heterogeneity of functional backgrounds has a forward effect on social performance at the significance level of 5% (β = 3.159, t = 2.363). Column (4) in Table 6 shows that functional background heterogeneity has no significant effect on corporate governance performance (β = 0.720, t = 1.108). Based on the above results, we find that functional background heterogeneity can improve corporate ESG performance as a whole. Moreover, functional background heterogeneity promotes corporate ESG performance mainly by promoting corporate performance in environmental and social responsibility. Therefore, Hypothesis 2 is verified.

Table 7 shows the outcomes of the regression analysis probing the effect of the overseas background heterogeneity of TMTs on corporate ESG performance. The first column of Table 7 displays that overseas background heterogeneity positively influences ESG performance at the 1% significance level (β = 1.676, t = 2.647). When examining the environmental, social, and governance aspects as dependent variables, the corresponding results are showcased in columns (2), (3), and (4) of Table 7, respectively. Column (2) in Table 7 reports that overseas background heterogeneity has a forward influence on environmental performance at the 1% significance level (β = 2.059, t = 2.615). Column

(3) in Table 7 reports that overseas background heterogeneity has a forward influence on social performance at the 1% significance level (β = 2.652, *t* = 2.759). Column (4) in Table 7 reports that overseas background heterogeneity has no significant impact on corporate governance (β = 0.541, *t* = 1.230). Based on the above results, we find that the overseas background heterogeneity of TMTs can promote corporate ESG performance as a whole. In addition, overseas background heterogeneity promotes corporate ESG performance mainly by promoting corporate performance in environmental and social responsibility. Therefore, Hypothesis 3 is verified.

Table 6. Functional background heterogeneity and corporate ESG performance.

	(1)	(2)	(3)	(4)
	ESG	**E**	**S**	**G**
Hfun	3.055 ***	4.272 ***	3.159 **	0.720
	(3.726)	(4.402)	(2.363)	(1.108)
Size	1.705 ***	2.196 ***	1.829 ***	0.740 ***
	(17.077)	(17.926)	(11.700)	(9.572)
Lev	−2.086 ***	−2.948 ***	−4.616 ***	1.635 ***
	(−3.612)	(−4.115)	(−5.031)	(3.529)
Cfo	1.746	3.580 *	3.153	−1.289
	(1.149)	(1.873)	(1.326)	(−1.049)
ROA	2.856	0.776	4.955 *	0.427
	(1.565)	(0.339)	(1.728)	(0.296)
Growth	−0.805 ***	−0.830 **	−1.229 ***	−0.315
	(−2.967)	(−2.497)	(−2.856)	(−1.526)
LnAge	0.981 ***	0.346	0.864 ***	2.081 ***
	(5.579)	(1.553)	(3.142)	(15.042)
TOP1	1.163 *	1.221 *	1.926 **	0.927 **
	(1.914)	(1.698)	(1.974)	(2.005)
Board	0.887 **	1.127 **	1.505 ***	−0.050
	(2.469)	(2.495)	(2.750)	(−0.172)
Indep	0.051	−0.038	−0.220	−0.997
	(0.045)	(−0.027)	(−0.125)	(−1.082)
_cons	−28.443 ***	−50.378 ***	−32.421 ***	22.392 ***
	(−12.806)	(−18.532)	(−9.273)	(12.946)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes
N	5879	5879	5879	5879
Adj.R^2	0.251	0.242	0.133	0.193

Note: t-statistics are enclosed in brackets, with *** indicating significance at the 0.1% level, ** at the 1% level, and * at the 5% level.

Table 7. Overseas background heterogeneity and corporate ESG performance.

	(1)	(2)	(3)	(4)
	ESG	**E**	**S**	**G**
Hoversea	1.676 ***	2.059 ***	2.652 ***	0.541
	(2.647)	(2.615)	(2.759)	(1.230)
Size	1.686 ***	2.170 ***	1.805 ***	0.735 ***
	(16.913)	(17.721)	(11.587)	(9.522)
Lev	−1.995 ***	−2.822 ***	−4.525 ***	1.656 ***
	(−3.437)	(−3.922)	(−4.897)	(3.581)
Cfo	1.449	3.198 *	2.737	−1.377
	(0.945)	(1.658)	(1.144)	(−1.116)
ROA	3.185 *	1.208	5.383 *	0.518
	(1.729)	(0.522)	(1.868)	(0.360)
Growth	−0.845 ***	−0.880 ***	−1.291 ***	−0.328
	(−3.106)	(−2.647)	(−2.987)	(−1.584)

Table 7. *Cont.*

	(1)	(2)	(3)	(4)
	ESG	**E**	**S**	**G**
LnAge	0.966 ***	0.313	0.882 ***	2.083 ***
	(5.523)	(1.407)	(3.227)	(15.046)
TOP1	1.325 **	1.421 **	2.181 **	0.980 **
	(2.176)	(1.969)	(2.235)	(2.105)
Board	0.953 ***	1.214 ***	1.589 ***	−0.032
	(2.649)	(2.682)	(2.906)	(−0.110)
Indep	0.132	0.067	−0.110	−0.974
	(0.116)	(0.048)	(−0.063)	(−1.057)
_cons	−26.483 ***	−47.599 ***	−30.519 ***	22.834 ***
	(−12.192)	(−17.943)	(−8.925)	(13.761)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes
N	5879	5879	5879	5879
Adj.R^2	0.251	0.241	0.133	0.193

Note: t-statistics are enclosed in brackets, with *** indicating significance at the 0.1% level, ** at the 1% level, and * at the 5% level.

5.3.2. The Moderating Effect of Top Management Incentives

The regression analysis results, which explore how monetary compensation incentives moderate the link between TMT heterogeneity and company ESG performance, are delineated in Table 8. In this table, the cross-coefficients between monetary compensation incentives and gender heterogeneity, functional background heterogeneity, and overseas background heterogeneity of TMTs are 1.974 (t = 2.844), 3.616 (t = 2.982), and 2.352 (t = 2.561), respectively, which are significantly positive at 1%, 1%, and 5%, respectively. This suggests that monetary compensation incentives exert a beneficial moderating effect on the influence of TMT heterogeneity on corporate ESG performance, consistent with the fourth hypothesis.

Table 8. The moderating effect of monetary compensation incentives.

	(1)	(2)	(3)
	ESG	**ESG**	**ESG**
Salary	0.623 ***	−1.422 *	0.789 ***
	(3.314)	(−1.717)	(5.297)
Hgen	−27.476 ***		
	(−2.744)		
Hgen × Salary	1.974 ***		
	(2.844)		
Hfun		−49.721 ***	
		(−2.844)	
Hfun × Salary		3.616 ***	
		(2.982)	
Hoversea			−34.345 **
			(−2.558)
Hoversea × Salary			2.352 **
			(2.561)
Size	1.453 ***	1.458 ***	1.462 ***
	(14.186)	(14.221)	(14.187)
Lev	−1.792 ***	−2.001 ***	−1.909 ***
	(−3.087)	(−3.445)	(−3.264)
Cfo	0.384	0.674	0.501
	(0.251)	(0.441)	(0.325)

Table 8. *Cont.*

	(1)	(2)	(3)
	ESG	**ESG**	**ESG**
ROA	0.924	0.552	0.935
	(0.489)	(0.293)	(0.492)
Growth	−0.808 ***	−0.786 ***	−0.807 ***
	(−2.978)	(−2.914)	(−2.970)
LnAge	0.999 ***	1.088 ***	0.975 ***
	(5.690)	(6.172)	(5.575)
TOP1	1.682 ***	1.740 ***	1.749 ***
	(2.806)	(2.890)	(2.897)
Board	0.993 ***	0.923 ***	0.963 ***
	(2.767)	(2.599)	(2.706)
Indep	−0.199	−0.194	−0.010
	(−0.177)	(−0.173)	(−0.009)
_cons	−30.439 ***	−2.259	−32.688 ***
	(−9.535)	(−0.188)	(−12.672)
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Firm	Yes	Yes	Yes
N	5879	5879	5879
Adj.R^2	0.261	0.261	0.260

Note: t-statistics are enclosed in brackets, with *** indicating significance at the 0.1% level, ** at the 1% level, and * at the 5% level.

Table 9 illustrates the results of the moderating impact of equity incentives on the cause-and-effect between TMT heterogeneity and corporate ESG performance. In this table, the cross-coefficients between equity incentives and gender heterogeneity, functional background heterogeneity, and overseas background heterogeneity of TMTs are −19.507 (t = −3.844), −11.920 (t = −2.493), and −2.733 (t = −0.563), respectively. This indicates that equity incentives play a negative moderating role in the effect of TMT heterogeneity on corporate ESG performance, aligning with Hypothesis 5. However, there are some differences in their significance. The cross-coefficient between overseas background heterogeneity and equity incentives is not significant.

Table 9. The moderating effect of equity incentives.

	(1)	(2)	(3)
	ESG	**ESG**	**ESG**
Equity	6.509 ***	4.558 ***	1.495
	(3.568)	(2.587)	(1.619)
Hgen	2.280 ***		
	(4.525)		
Hgen × Equity	−19.507 ***		
	(−3.844)		
Hfun		0.417	
		(1.163)	
Hfun × Equity		−11.920 **	
		(−2.493)	
Hoversea			1.707 **
			(2.371)
Hoversea × Equity			−2.733
			(−0.563)
Size	1.693 ***	1.688 ***	1.690 ***
	(17.017)	(16.869)	(16.957)
Lev	−1.948 ***	−2.050 ***	−2.029 ***
	(−3.364)	(−3.540)	(−3.499)

Table 9. *Cont.*

	(1)	(2)	(3)
	ESG	**ESG**	**ESG**
Cfo	1.755	1.816	1.528
	(1.152)	(1.192)	(0.998)
ROA	2.928	2.902	3.058 *
	(1.588)	(1.578)	(1.653)
Growth	−0.856 ***	−0.820 ***	−0.851 ***
	(−3.135)	(−3.007)	(−3.135)
LnAge	1.103 ***	1.090 ***	1.059 ***
	(6.075)	(5.856)	(5.858)
TOP1	1.369 **	1.304 **	1.304 **
	(2.274)	(2.155)	(2.163)
Board	1.059 ***	0.970 ***	0.997 ***
	(2.911)	(2.683)	(2.759)
Indep	0.100	0.065	0.066
	(0.088)	(0.057)	(0.058)
_cons	−27.671 ***	−26.903 ***	−26.894 ***
	(−12.623)	(−12.272)	(−12.239)
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Firm	Yes	Yes	Yes
N	5879	5879	5879
Adj.R^2	0.253	0.250	0.249

Note: t-statistics are enclosed in brackets, with *** indicating significance at the 0.1% level, ** at the 1% level, and * at the 5% level.

Table 10 illustrates the results of the moderating effect of control right incentives on the cause-and-effect between TMT heterogeneity and corporate ESG performance. In this table, the cross-coefficients between control incentives and gender heterogeneity, functional background heterogeneity, and overseas background heterogeneity are 2.695 (t = 2.454), 8.798 (t = 4.622), and 3.860 (t = 2.309), respectively, showing a considerably positive correlation at significance levels of 1%, 1%, and 5%, respectively. This indicates that control incentives play a positive moderating role in the effect of TMT heterogeneity on corporate ESG performance, aligning with the Hypothesis 6.

Table 10. The moderating effect of control right incentive.

	(1)	(2)	(3)
	ESG	**ESG**	**ESG**
Control	0.433	−6.064 ***	−0.361
	(1.342)	(−4.781)	(−1.632)
Hgen	2.206 ***		
	(4.066)		
Hgen × Control	2.695 **		
	(2.454)		
Hfun		−1.281	
		(−1.379)	
Hfun × Control		8.798 ***	
		(4.622)	
Hoversea			−0.227
			(−0.243)
Hoversea × Control			3.860 **
			(2.309)
Size	1.706 ***	1.693 ***	1.684 ***
	(17.168)	(17.034)	(16.962)

Table 10. *Cont.*

	(1)	(2)	(3)
	ESG	**ESG**	**ESG**
Lev	−1.993 ***	−2.186 ***	−2.041 ***
	(−3.445)	(−3.792)	(−3.518)
Cfo	1.836	1.679	1.792
	(1.202)	(1.109)	(1.176)
ROA	2.707	2.795	3.012
	(1.465)	(1.525)	(1.634)
Growth	−0.817 ***	−0.771 ***	−0.814 ***
	(−2.989)	(−2.833)	(−2.979)
LnAge	0.952 ***	1.008 ***	0.918 ***
	(5.344)	(5.639)	(5.163)
TOP1	1.186 **	1.181 *	1.127 *
	(1.961)	(1.947)	(1.859)
Board	0.918 **	0.837 **	0.890 **
	(2.526)	(2.327)	(2.464)
Indep	0.203	0.023	0.242
	(0.179)	(0.020)	(0.213)
_cons	−27.087 ***	−26.868 ***	−25.987 ***
	(−12.525)	(−12.050)	(−12.032)
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Firm	Yes	Yes	Yes
N	5879	5879	5879
Adj.R^2	0.251	0.254	0.250

Note: t-statistics are enclosed in brackets, with *** indicating significance at the 0.1% level, ** at the 1% level, and * at the 5% level.

6. Robustness Tests

The diversity of measurement methods for variables may lead to differences in empirical results. Therefore, to ascertain the affirmative linkage between the heterogeneity of TMTs and ESG performance, alongside the reliability of the moderating variables, this paper successively replaces the ESG rating standard and the measurement methods of monetary compensation incentives and control right incentives in robustness tests.

6.1. Change of ESG Rating Criteria

A robustness test is necessary to verify the reliability of the empirical results. Different rating agencies use varying standards to measure corporate ESG performance, leading to potentially divergent ratings for the same company. To address this, we conducted a robustness test by replacing the ESG rating criteria. The ESG evaluation system of Sino-Securities is constructed by referring to the international mainline ESG evaluation system and adjusting with the specialty of the Chinese domestic market, which is mainly manifested as high update frequency (quarterly update), widespread coverage (covering all A-share listed companies in China), and high availability of data. The Sino-Securities ESG index system includes 14 subjects, 26 core markers, and over 130 sub-markers pursuant to the three pillars of environment, society, and governance. The ESG rating results of Sino-Securities were used to replace Bloomberg ESG ratings and re-examine the cause-and-effect between TMT heterogeneity and corporate ESG performance. Table 11 reports the results after changing the ESG rating criteria. These results accord closely with those of the main test. This suggests that the ultimate inference of this study is still unshaken after changing the ESG rating criteria.

Table 11. Change of ESG rating criteria.

	(1)	(2)	(3)
	ESG	**ESG**	**ESG**
Hgen	1.544 ***		
	(3.260)		
Hfun		3.057 ***	
		(3.734)	
Hoversea			1.602 **
			(2.546)
Size	1.697 ***	1.706 ***	1.687 ***
	(17.042)	(17.127)	(16.963)
Lev	−1.909 ***	−2.110 ***	−2.018 ***
	(−3.294)	(−3.658)	(−3.480)
Cfo	1.689	1.873	1.579
	(1.109)	(1.235)	(1.031)
ROA	2.914	2.779	3.108 *
	(1.577)	(1.513)	(1.677)
Growth	−0.831 ***	−0.799 ***	−0.837 ***
	(−3.052)	(−2.950)	(−3.084)
LnAge	0.957 ***	0.995 ***	0.976 ***
	(5.454)	(5.673)	(5.595)
TOP1	1.152 *	1.092 *	1.250 **
	(1.914)	(1.812)	(2.072)
Board	0.984 ***	0.879 **	0.944 ***
	(2.721)	(2.450)	(2.628)
Indep	0.119	0.137	0.213
	(0.105)	(0.120)	(0.188)
_cons	−26.951 ***	−28.455 ***	−26.481 ***
	(−12.476)	(−12.854)	(−12.230)
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Firm	Yes	Yes	Yes
N	5879	5879	5879
Adj.R^2	0.251	0.251	0.250

Note: t-statistics are enclosed in brackets, with *** indicating significance at the 0.1% level, ** at the 1% level, and * at the 5% level.

6.2. Change of the Measurement of Monetary Compensation Incentives

In the robustness test, this paper employs the total annual salaries of all executives as an alternative measure for monetary compensation incentives. Table 12 reports the results. In this table, the cross-coefficients of monetary compensation incentives and gender heterogeneity, functional background heterogeneity, and overseas background heterogeneity are 2.212 (t = 3.415), 2.573 (t = 2.353), and 2.473 (t = 2.935), respectively, which are significantly positive at 1%, 5%, and 1%, respectively. These results accord closely with the results of the main test. This indicates that the conclusion is still reliable after changing the monetary compensation incentive measurement.

Table 12. Change of the measurement of monetary compensation incentives.

	(1)	(2)	(3)
	ESG	**ESG**	**ESG**
Salary	0.735 ***	−0.585	0.940 ***
	(4.071)	(−0.790)	(6.968)
Hgen	−32.075 ***		
	(−3.314)		
Hgen × Salary	2.212 ***		
	(3.415)		

Table 12. *Cont.*

	(1)	(2)	(3)
	ESG	**ESG**	**ESG**
Hfun		−36.492 **	
		(−2.223)	
Hfun × Salary		2.573 **	
		(2.353)	
Hoversea			−37.792 ***
			(−2.950)
Hoversea × Salary			2.473 ***
			(2.935)
Size	1.363 ***	1.375 ***	1.365 ***
	(13.155)	(13.257)	(13.093)
Lev	−1.686 ***	−1.930 ***	−1.830 ***
	(−2.912)	(−3.331)	(−3.141)
Cfo	0.430	0.743	0.544
	(0.283)	(0.488)	(0.355)
ROA	0.501	0.194	0.544
	(0.266)	(0.103)	(0.287)
Growth	−0.826 ***	−0.790 ***	−0.797 ***
	(−3.050)	(−2.920)	(−2.931)
LnAge	1.037 ***	1.105 ***	0.997 ***
	(5.954)	(6.298)	(5.731)
TOP1	1.815 ***	1.843 ***	1.909 ***
	(3.059)	(3.085)	(3.182)
Board	0.789 **	0.714 **	0.753 **
	(2.195)	(2.003)	(2.114)
Indep	−0.297	−0.265	−0.084
	(−0.264)	(−0.235)	(−0.075)
_cons	−30.076 ***	−11.517	−32.815 ***
	(−9.674)	(−1.024)	(−13.291)
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Firm	Yes	Yes	Yes
N	5879	5879	5879
Adj.R^2	0.267	0.265	0.265

Note: t-statistics are enclosed in brackets, with *** indicating significance at the 0.1% level and ** at the 1% level.

6.3. Change of the Measurement of Control Right Incentives

In the robustness test, referring to Luo et al. [109], this study uses executive perks to replace CEO–chairman duality to measure control right incentives. When executives have control rights, they enjoy a lot of in-service spending, so control right incentives can be quantified as executive perks. The specific contents of in-service consumption include: office expenses, travel expenses, business entertainment expenses, directors' dues, car fares, and conference expenses, among others. These expenses are legal and necessary expenses for executives to conduct the day-to-day affairs of the company. Senior executives have the right to spend these expenses within a certain range to meet their own utility. Therefore, this study selects executive perks to measure control right incentives. Specific data are collected by referring to the notes accompanying the annual financial statements of publicly traded companies.

Table 13 reports the results of the moderating effect after changing the measurement method of control right incentives. In this table, the cross-coefficients between control incentives and gender heterogeneity, functional background heterogeneity, and overseas background heterogeneity are 70.255 (t = 2.851), 68.034 (t = 0.674), and 74.236 (t = 2.092), respectively. It can be seen that these results accord closely with those of the main test. These results are consistent with those of the main test, indicating that the conclusion remains reliable after changing the measurement technique of control right incentives.

Table 13. Change of the measurement of control right incentives.

	(1)	(2)	(3)
	ESG	**ESG**	**ESG**
Control	−36.813 ***	−30.307	−27.455 ***
	(−4.660)	(−0.441)	(−4.706)
Hgen	0.736		
	(1.247)		
Hgen × Control	70.255 ***		
	(2.851)		
Hfun		2.158 *	
		(1.749)	
Hfun × Control		68.034	
		(0.674)	
Hoversea			0.668
			(0.862)
Hoversea × Control			74.236 **
			(2.092)
Size	1.238 ***	1.274 ***	1.242 ***
	(10.386)	(10.745)	(10.461)
Lev	−1.453 **	−1.626 **	−1.616 **
	(−2.195)	(−2.467)	(−2.445)
Cfo	0.294	0.600	0.125
	(0.166)	(0.340)	(0.070)
ROA	5.047 **	5.082 **	5.125 **
	(2.312)	(2.338)	(2.346)
Growth	−1.181 ***	−1.131 ***	−1.132 ***
	(−3.764)	(−3.619)	(−3.636)
LnAge	0.921 ***	0.913 ***	0.916 ***
	(4.743)	(4.720)	(4.766)
TOP1	1.605 **	1.535 **	1.670 **
	(2.277)	(2.154)	(2.361)
Board	1.174 ***	1.091 ***	1.152 ***
	(2.799)	(2.614)	(2.767)
Indep	−0.355	−0.420	−0.310
	(−0.270)	(−0.319)	(−0.236)
_cons	−17.161 ***	−18.912 ***	−17.058 ***
	(−6.736)	(−7.301)	(−6.724)
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Firm	Yes	Yes	Yes
N	5879	5879	5879
Adj.R^2	0.197	0.195	0.196

Note: t-statistics are enclosed in brackets, with *** indicating significance at the 0.1% level, ** at the 1% level, and * at the 5% level.

7. Endogenous Treatment

7.1. SYS-GMM Model Test

Corporate ESG performance is a continuous and dynamic process, and the ESG performance of the previous period will have an impact on the ESG performance of the current period. Therefore, this paper adopts the GMM estimation method proposed by Arellano and Bond [110], Arellano and Bover [111], and Blundell and Bond [112] to solve the possible endogeneity problems. GMM is divided into difference GMM and system GMM, and the difference GMM estimator is biased by the influence of weak instrumental variables.

Table 14 shows the system GMM estimation regression results. The *p*-values of the AR(1) test are 0.000, which is less than the standard value of 0.1; the *p*-values of the AR(2) test are greater than the standard value of 0.1; and the *p*-values of the Hansen test are greater than 0.1. It can be shown that the model does not have the problem of serial autocorrelation

and over-identification, and the regression results are credible. In the regression results, Hgen, Hfun, and Hoversea still maintain significantly positive correlations with the ESG performance of enterprises, indicating that the research conclusions are still robust.

Table 14. The results of the SYS-GMM model test.

	(1)	(2)	(3)
	ESG	**ESG**	**ESG**
L.ESG	0.352 ***	0.220 ***	0.355 ***
	(4.507)	(3.371)	(4.967)
Hgen	1.481		
	(0.216)		
Hfun		47.552 ***	
		(2.820)	
Hoversea			−3.178
			(−0.411)
Size	2.32 ***	3.049 ***	2.287 ***
	(2.724)	(2.653)	(2.786)
Lev	−1.796	−1.829	−1.681
	(−0.792)	(−0.542)	(−0.698)
Cfo	1.559	−0.955	1.073
	(0.835)	(−0.345)	(0.590)
ROA	2.642	−1.028	0.369
	(0.993)	(−0.261)	(0.143)
Growth	−0.440	−0.602	−0.589 **
	(−1.605)	(−1.440)	(−2.086)
LnAge	0.130	0.602	−0.128
	(0.194)	(0.589)	(−0.174)
TOP1	7.472	7.641	4.073
	(1.61)	(1.167)	(0.983)
Board	0.097	−0.984	−0.093
	(0.145)	(−1.118)	(−0.138)
Indep	−0.375	1.486	0.043
	(−0.265)	(0.668)	(0.030)
_cons	−42.345 **	−86.77 ***	−39.123 **
	(−2.312)	(−2.974)	(−2.351)
N	5216	5216	5216
Arellano–Bond AR(1)	0.000	0.000	0.000
Arellano–Bond AR(2)	0.368	0.174	0.480
Hansen	0.128	0.195	0.117

Note: t-statistics are enclosed in brackets, with *** indicating significance at the 0.1% level and ** at the 1% level.

7.2. Instrumental Variable Test

The heterogeneity of TMTs will affect corporate ESG performance, and in turn, corporate ESG performance may also affect the heterogeneity of TMTs. To mitigate the potential endogenous effects of reverse causality on our findings, we employ instrumental variables in our empirical analysis. Drawing on Faccio et al. [113], Ferris et al. [114], and Bemile et al. [115], we use the average TMT heterogeneity of other firms within the same industry and year as an instrumental variable for two-stage least squares (2SLS) regression. Firms within the same industry share common industry characteristics, and the TMT heterogeneity of other firms within the same industry may influence a firm's own TMT heterogeneity, but it does not directly impact the firm's ESG performance. Therefore, the average TMT heterogeneity of other firms within the same industry satisfies the criteria for an instrumental variable.

According to Table 15, in the regression results of the first stage, the instrumental variables are significantly and positively correlated with TMT heterogeneity at the level of 1%. In the regression results of the second stage, the estimated coefficients between the instrumental variables and enterprise ESG performance demonstrate a significant and posi-

tive association at a significance level of 5%. The further under-identification test and weak identification test on the appropriateness of instrumental variables show that the test results of the Kleibergen–Paap rk LM statistic and Kleibergen–Paap rk Wald F statistic are significant, indicating that the choice of instrumental variables is justifiable. The instrumental variable regression results are largely consistent with those of the baseline regression.

Table 15. The results of endogenous treatment regression.

	(1)	(2)	(3)
	ESG	**ESG**	**ESG**
Hgen	8.531 **		
	(1.985)		
Hfun		39.035 ***	
		(6.838)	
Hoversea			1.602 **
			(2.546)
Size	1.959 ***	1.877 ***	1.737 ***
	(20.800)	(17.458)	(15.841)
Lev	−2.351 ***	−3.300 ***	−2.963 ***
	(−2.967)	(−4.768)	(−3.519)
Cfo	2.650	3.650 **	1.882
	(1.542)	(1.995)	(1.112)
ROA	−0.313	0.707	3.519 *
	(−0.159)	(0.315)	(1.782)
Growth	−0.786 ***	−0.749 **	−0.812 ***
	(−2.820)	(−2.451)	(−3.258)
LnAge	1.536 ***	2.100 ***	1.293 ***
	(8.341)	(9.608)	(7.618)
TOP1	0.497	0.619	0.833
	(0.769)	(0.912)	(1.083)
Board	0.889 **	0.101	0.839 **
	(2.005)	(0.234)	(2.281)
Indep	−0.850	−1.034	−0.213
	(−0.696)	(−0.764)	(−0.367)
_cons	−31.385 ***	−33.612 ***	−37.136 ***
	(−11.447)	(−12.188)	(−12.863)
First-stage regressions	3.663 ***	2.782 ***	4.134 ***
	(10.904)	(10.173)	(10.542)
Kleibergen–Paap rk LM statistic	116.599	101.717	109.216
	[0.0000]	[0.0000]	[0.0000]
Kleibergen–Paap rk Wald F statistic	118.891	103.386	111.186
	[16.38]	[16.38]	[16.38]
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Firm	Yes	Yes	Yes
N	5879	5879	5879
Adj.R^2	0.193	0.195	0.198

Note: t-statistics are enclosed in brackets, with *** indicating significance at the 0.1% level, ** at the 1% level, and * at the 5% level.

8. Conclusions and Recommendations

8.1. Conclusions

As a result of the disjunction of property rights and managerial authority, the TMT holds the corporate control rights, which is crucial for the advancement of the company. In the context of an increasingly complex and changeable business environment, it is more explanatory to study the influence of the demographic background characteristics of TMTs on corporate decision making and performance than that of individual managers (such as the CEO). However, while research on the impact of TMT heterogeneity on firm strategy and investment is abundant, there is a relative scarcity of studies on its influence

on firm ESG performance. Despite being a significant element influencing enterprise decision making, it is yet unclear how the heterogeneity of TMTs will impact firm ESG performance. Building on the upper echelons theory, this paper investigates the influence of TMT heterogeneity on firm ESG performance and the moderating effect of top management incentives. We utilize data from China's A-share listed companies over the period of 2011 to 2022 as our sample dataset.

The findings of this paper show that the gender heterogeneity, functional back-ground heterogeneity, and overseas background heterogeneity of top management teams have significant positive impacts on corporate ESG performance, and the monetary compensation incentives and control incentives of top management teams play a positive moderating role, while equity incentives exhibit a negative moderating effect. These findings remain robust across alternative measures of corporate ESG ratings and monetary and control incentives, and through the SYS-GMM model test and instrumental variable approach to address endogeneity.

This paper is noteworthy for its analysis of the economic consequences of TMT heterogeneity from the perspective of corporate ESG performance, using microdata from Chinese listed companies. The effect of TMT heterogeneity on corporate ESG performance is theoretically analyzed and empirically tested. This paper reveals the promoting effect of TMT heterogeneity on corporate ESG performance, enriches the research content on TMT heterogeneity and its economic consequences, and expands the research on the influencing factors of corporate ESG. This study also examines the moderating role of top management incentives on the cause-and-effect between TMT heterogeneity and corporate ESG performance and further deepens the understanding of the correlation among TMT heterogeneity, top management incentives, and corporate ESG performance. In addition, the research conclusions of this paper provide a practical reference for enterprises to construct more flexible TMTs, formulate a more targeted top management incentive mechanism, and improve ESG performance more effectively.

8.2. Recommendations

Based on the above findings, this paper has the following important implications for management and policy.

First of all, in order to improve the ESG performance of enterprises, enterprises should actively promote the diversity of top management teams, including gender diversity, functional background diversity, and overseas background diversity. This can be achieved by developing fair recruitment processes, eliminating gender bias, and establishing women's leadership development programs. At the same time, they can promote the diversity of functional backgrounds by encouraging job rotation and exchange programs between different departments, as well as actively seeking candidates with different professional backgrounds in the recruitment process. In addition, priority can be given to those candidates with overseas work experience or international education backgrounds, and international exchange activities can be organized to enhance cultural understanding and collaboration among team members.

Second, companies need to align incentives to support the achievement of ESG goals. This includes the adoption of non-equity incentives, such as performance bonuses and long-term service awards, which can be linked to ESG performance and encourage executives to focus on long-term sustainability rather than short-term profits. At the same time, the compensation level of senior executives should be in line with the market, and a certain degree of decision-making freedom should be given to them, including the right of project selection and budget allocation, so as to improve their sense of participation and responsibility.

Third, to ensure the effective implementation of ESG objectives, enterprises should establish a comprehensive ESG management system. This includes assigning clear ESG responsibilities to each executive, such as specific goals for environmental impact reduction, community engagement, and supply chain management, and incorporating these respon-

sibilities into performance evaluation criteria. There is also a need for regular internal seminars and training sessions to raise executives' awareness and understanding of ESG topics, and encourage them to attend industry conferences, seminars, and online courses to learn about the latest ESG trends and technologies, thus building their capabilities in driving sustainability.

Fourthly, in order to support the ESG practices of enterprises, the government can provide support and guidance from multiple perspectives. First, the government can encourage companies to adopt ESG best practices by issuing relevant policies and guiding principles and set ESG disclosure standards that require companies to report ESG information in their annual reports. Secondly, the government can provide incentives such as financial subsidies and tax breaks to reward those companies with outstanding ESG performance. In addition, the government also needs to establish a comprehensive regulatory framework to ensure that companies comply with the laws and regulations of ESG, such as environmental protection regulations and labor rights protection. Finally, the government can also carry out public publicity campaigns to raise public awareness of the importance of ESG, thus creating a good social atmosphere for enterprises, and strengthen cooperation with other countries to jointly develop international standards and protocols to promote ESG practices worldwide. Through these measures, the government can effectively support enterprises to improve ESG performance and promote the sustainable development of society and the environment.

9. Limitations and Future Research

In this study, we endeavor to make the research conclusions as reliable as possible through a variety of efforts, including a large amount of literature collation, careful research design, meticulous analysis and demonstration, and rigorous data analysis. Nevertheless, the following deficiencies are inevitable in this investigation. First of all, the ESG performance evaluation of A-share listed companies by local rating agencies started late and is limited to non-mandatory ESG information disclosure. Consequently, the coverage of evaluation results is small and the time span is short. In addition, the current evaluation objects of rating agencies mostly focus on enterprises with good market performance, so the samples selected in this paper are not enough to explain the entire A-share market. Secondly, the characteristics of top management teams that affect the ESG performance of enterprises cover many aspects, and the paper does not take into account the heterogeneity of executives in political connections, education level, tenure, and other aspects. Moreover, the measurement of the heterogeneity of top management teams in this paper is still at the level of demographic background characteristics, and psychological characteristics that are difficult to quantify are not studied. Third, this paper only discusses the impact mechanism of top management team heterogeneity on ESG performance from the three detailed aspects of ESG, environmental, social, and governance, and does not delve further into other potential mechanisms. Thus, future research can expand the selection scope of TMT personnel characteristic variables, such as power desire, loyalty, and other psychological heterogeneity, to comprehensively reveal the relationship and potential mechanism between TMT heterogeneity and ESG performance. In addition, future research can try to explore the driving factors of ESG performance of enterprises from multiple perspectives based on more comprehensive and extensive data support.

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