

Top Management Team Cognitive Heterogeneity and Corporate Social Responsibility Performance

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Abstract

Based on stakeholder theory, this study constructs an evaluation system of corporate social responsibility (CSR) performance indicators in three dimensions: economic, social and environmental. And by focusing on the mediating role of green innovation, the influence of Top Management Team (TMT) cognitive heterogeneity on CSR performance is explored. Ownership type and environmental regulation are considered as moderating variables affecting the above relationship. Based on the annual reports of Chinese manufacturing companies listed in Shanghai and Shenzhen A-shares from 2015 to 2021, it is found that TMT cognitive heterogeneity inhibits CSR performance. But at the same time, TMT cognitive heterogeneity also promotes CSR performance by stimulating corporate green innovation, which is manifested as a masking effect. Ownership type and environmental regulation moderate the masking effect of green innovation on TMT cognitive heterogeneity and CSR performance.

Keywords: top management team, cognitive heterogeneity, corporate social responsibility performance, corporate green innovation, masking effect

1. Introduction

In recent years, more and more listed companies have released corporate social responsibility (CSR) reports one after another, and companies are increasingly concerned about the fulfillment and disclosure of CSR. The outbreak of social issues such as food safety, labor rights, and environmental pollution has led to frequent phenomena such as the tragic share price cuts of listed companies in the stock market, which all hint at the effectiveness of CSR on the capital market (Tian & Lin, 2017). Countries around the world have also paid great attention to resource and environmental issues, and have asked enterprises to fulfill their social responsibilities. With the increasing pressure from the ecological environment and the international community to reduce emissions, environmental issues have received great attention from the Chinese government. Reducing environmental hazards from business operations is one of the keys to solving environmental problems, and governments, consumers and other stakeholders in business are focusing their attention on companies, demanding that they make efforts to protect the environment and take measures that will ensure environmental safety (Cordano, 1993). The government has introduced a series of policies to stimulate the environmental behavior of enterprises; consumers consider the fulfillment of environmental responsibility by enterprises as an important factor in their purchasing decisions (Zeng et al., 2021); the media has paid more attention to the fulfillment of environmental responsibility by enterprises (Godos-Diez et al., 2020; Lee et al., 2015) and exerted pressure on enterprises through reports ... With the demand for environmental protection from many stakeholders, enterprises are increasingly aware of the importance of solving environmental problems to maintain the legitimacy and competitiveness of enterprises (Kim & Kim, 2016). By fulfilling CSR, companies not only gain a good reputation (Karwowski & Raulinajtys-Grzybek, 2021), but also gain the trust and loyalty of their customers (Chuang & Huang, 2018; Shu et al., 2016).

It is no coincidence that the business objectives of enterprises are also undergoing a subtle transformation. While traditional research has focused on maximizing corporate value and pursuing economic profit as the ultimate goal (Xie et al., 2019), existing research suggests that companies must take into account the rights and interests of other stakeholders and be socially and environmentally responsible while achieving their own growth

(Alexopoulos et al., 2018). Previous evaluations of corporate performance have mostly used single indicators such as ROA or Tobin' Q value to measure (Xie et al., 2015) or multidimensional financial indicators to measure corporate development (Du et al., 2018), ignoring the corporate contribution to the environment, which is clearly no longer applicable to measure the current corporate development aspirations (Seman et al., 2019). Some scholars have also paid early attention to the importance of the environment and explored the drivers of corporate environmental performance and green performance, but it is unlikely that companies will sacrifice their economic interests to the mere improvement of the environment (Clarkson et al., 2004). Thus, it seems that it is urgent to build a CSR performance index system in line with the current development of enterprises. How to transform from a traditional economy to a green economy and achieve a multi-win pattern of environment-economy-society has become an important issue that needs to be solved jointly for the forward development of countries around the world (Fernando et al., 2019). Therefore, from the perspective of all stakeholders, this paper constructs an evaluation system of CSR performance indicators containing three dimensions: economic, social and environmental, in order to reasonably measure the current development of enterprises and promote them to achieve a multi-win pattern.

Environmental protection is not only a central theme in academia, but also an urgent issue for top corporate executives. In a complex and rapidly changing environment, strategy formulation is increasingly becoming a shared activity requiring more efficient team-based operations. The TMT, which is composed of key managers responsible for developing and implementing corporate strategy, plays a decisive role in the overall corporate strategic management process (Lau et al., 2016; Reimer et al., 2018). Based on the upper echelons theory, the values and cognitive base of the TMT can have a significant impact on strategic decisions during strategy formulation or implementation, while the cognitive and social psychology of the TMT can be inferred based on the demographic characteristics of its members, which in turn affects the performance of the firm (Hambrick et al., 1996). For example, top managers make judgments about whether to implement environmental strategies based on their own preferences. These preferences reflect the decision maker's perceptions of environmental protection and reasonable expectations of national policies and the future prospects of the firm (Wiersema & Bantel, 1992). At the same time, preferences also reflect the values of decision makers. Being in a complex external environment, strategic decision makers can only partially understand the events in the environment and use their cognitive base and values to make decisions (March & Simon, 1993). The TMT cognitive heterogeneity represents a collection of strategic decision makers' values that enriches the information quality of decisions (Eesley et al., 2014) and allows for more rational decision making through complementary resources (Amason, 1996). Therefore, it is of great relevance to explore how TMT cognitive heterogeneity affects the development of corporate environmental strategies and their impact on CSR performance, and can contribute to better corporate development through executive staffing (Tuggle, 2010).

Finally, studies that do not take into account the internal and external environment faced by enterprises are one-sided, and the research results have various uncertainties and are far from reality (Ocasio, 1997). In addition, as far as the country of study is concerned, most of the existing studies have taken the U.S. listed companies as the object of study, and little attention has been paid to the listed companies in emerging economies, especially in China. Therefore, this study extends the existing literature and further develops a theoretical model to explain the impact of TMT cognitive heterogeneity (i.e., heterogeneity in the educational level and professional background of the TMT) on corporate environmental strategies in the Chinese context, which may be driven not only by the composition of the TMT but also by the internal environment (e.g., type of corporate ownership) and the external environment (e.g. environmental regulation), which in turn affects CSR performance (Cui & Wang, 2021; Yu et al., 2017). The rest of the paper is presented below. We first review the relevant literature and propose the research hypothesis of this paper based on the theoretical framework. Secondly, we introduce the data sources and empirical methods, and construct an evaluation system of CSR performance indicators. Then, we give the empirical results, discuss and give conclusions for the empirical results. Finally, the theoretical and practical implications of this paper are pointed out and future research directions are given based on the limitations of this paper.

2. Literature Review

2.1 TMT Cognitive Heterogeneity and CSR Performance

In order to sustain ecological business practices and corporate profits, companies must simultaneously meet the demands of CSR from customers, social groups, governments, and communities (Hojnik & Ruzzier, 2016). Modern companies are increasingly proactive in taking CSR and promoting the implementation of sustainability activities to meet current environmental and social challenges (Carroll, 1991; Rehman et al., 2020). Nowadays, there are mainly two views of social responsibility (Danilovic et al., 2015): the broad CSR is equivalent to

corporate responsibility, while the narrow CSR mainly refers to ethical and philanthropic responsibility, excluding economic and legal responsibility. In this study, we agree with the broad view of CSR, that while seeking to maximize shareholders' interests, enterprises also have the obligation to maintain and promote the public interests of society, and to achieve the coordinated and sustainable development of enterprises, society and the environment.

Exploring the drivers of CSR reveals that they are influenced by different internal and external governance mechanisms of the firm (Li et al., 2019). Externally to the firm, effective strategic partnerships (involving greater diversity and longer partnerships in the social sector) can encourage corporate sustainability (Valbuena-Hernandez & Ortiz-de-Mandojana, 2022). At the same time, subject to external regulatory pressures, firms' radical green innovation can be facilitated by exploratory green learning to enhance the firm's green development (Cui & Wang, 2021). From within the firm, on the one hand, balancing board composition and compensation can better achieve CSR outcomes and value creation among stakeholders (Arayakarnkul et al., 2022). On the other hand, the characteristics or diversity of board and executive members also contribute to CSR performance. Female directors and managers are more enthusiastic about social dimensions and engagement with stakeholders (Galletta et al., 2022; Orazalin & Baydauletov, 2020), and gender and age diversity enhances CSR investment and approach decisions (Islam et al., 2022). CEOs with financial backgrounds, overseas backgrounds, and younger CEOs are more inclined to engage in activities that improve sustainability or environmental performance (Shahab et al., 2020). TMT educational background heterogeneity and tenure heterogeneity can have an impact on corporate performance by focusing on the mediating role of environmental strategies (Lee et al., 2021). Scholars have also introduced ideological diversity as a new type of board-level diversity and examined its impact on CSR performance (Olthuis & Oever, 2020).

A systematic analysis reveals that studies have focused more on the impact of internal corporate governance mechanisms on CSR performance and mainly on observable heterogeneity such as ethnicity, age and gender heterogeneity (Galletta et al., 2022; Islam et al., 2022). In contrast to the former, heterogeneity at the cognitive level, such as the occupational background and education level of TMT, largely constitute the cognitive basis of individuals and are important factors influencing their behavioral decisions (Anderson et al., 2011; Barkema et al., 2007; Tuggle, 2010). On the one hand, occupational background refers to the category of organizational functions undertaken by team members prior to joining the team (Carpenter & Westphal, 2001) and usually reflects the expertise and skills possessed by executive members. A high degree of heterogeneity in occupational backgrounds means that companies have less overlap in expertise and skills, giving teams a broader pool of resources (Valbuena-Hernandez & Ortiz-de-Mandojana, 2022) and reducing their human resource costs. At the same time, professional background determines how individuals perceive and present problems and problem-solving styles, and different executive members focus on different kinds of information, enabling the firm to draw knowledge from multiple sources, enabling complementary resources among TMT members, making more rational strategic decisions, and enabling the firm to grow sustainably (Olson et al., 2006). On the other hand, the level of education reflects, to some extent, the knowledge base, cognitive ability and values of a person, and influences his or her behavior (Lewis et al., 2014; Sun et al., 2021). Executives with higher education levels tend to have a stronger sense of social responsibility (Amore et al., 2019), because they are often taught to "follow the rule of law", "follow ethics", and "protect the environment" in school. However, executives with lower education levels will not be promoted easily and will therefore pay more attention to their reputation and social status in order to retain the power and status they have today, and will increase their attention to environmental issues in order to meet social expectations and prevent them from bringing negative effects to themselves. Based on the inference above, the following hypotheses are proposed:

H1: TMT cognitive heterogeneity is significantly and positively related to CSR performance.

H1a: Heterogeneity of education level of TMT is significantly and positively correlated with CSR performance.

H1b: Heterogeneity of professional background of TMT is significantly and positively correlated with CSR performance.

2.2 TMT Cognitive Heterogeneity and Corporate Green Innovation Behavior

Research on corporate green innovation behavior has focused on board composition (e.g., external and internal board size) (Haque, 2017; Liao et al., 2015; Peters & Romi, 2014) and TMTs (e.g., executive compensation packages) (Haque, 2017; Reimer et al., 2018), yet neglects the impact of TMT cognitive characteristics on corporate environmental strategies. Previous studies have shown that CEOs with risk-averse preferences tend to engage in more carbon emissions (Hossain et al., 2022); the education level of CEOs can promote environmental innovation in firms, especially when external environmental pressures are more stringent (Zhou et al., 2021);

meanwhile, Gifford and Nilsson (2014) reviewed the personal and social influences on pro-environmental concerns and behaviors in the context of previous research and noted that personal factors, including values and cognitive biases, can have an impact on pro-environmental behaviors. In addition, personal characteristics (gender, family situation, geographic origin, education, etc.) of firm employees and decision makers have a facilitating effect on innovative activities in the environmental sector (Horbach & Jacob, 2018). Based on the heterogeneity of low-carbon behaviors, other scholars have examined the role of low-carbon awareness in promoting low-carbon behaviors (Zhou et al., 2020). In summary, executives' own characteristics imply their cognitive preferences and values, which can influence their environmental behavior. However, it is also worthwhile to pay attention to how the cognitive diversity or heterogeneity of the TMT as a whole affects corporate green behavior.

On the one hand, cognitive heterogeneity of the TMT can bring about a "green effect". In order to achieve a good corporate reputation or to respond to government mandates (Xie et al., 2019), the TMT must not only deliver economic benefits to internal stakeholders such as shareholders, but also focus on the interests of external stakeholders such as communities, governments and consumers outside the company. A group with a high level of educational and professional heterogeneity will have a wider range of knowledge, skills and abilities, and will be more socially connected to stakeholders. Rich information resources will allow members to consider the wishes of all stakeholders, consider issues from a wide range of perspectives and positions, and make comprehensive perceptions and decisions (Tuggle, 2010), which in turn will increase the company's green behavior. On the other hand, cognitive heterogeneity of the TMT can also have an "innovation effect". The higher the heterogeneity of the TMT's professional background, the more diverse the team's access to information. Different ways of thinking can help the TMT analyze and evaluate the problem from different perspectives (Olson et al., 2006), while the collision of members with different ideas can generate new insights and reconfiguration of ideas, thus stimulating green innovation behavior and enhancing the green innovation capability of enterprises (Cannella et al., 2009). At the same time, members with high education level are knowledgeable, active, and capable of learning, and they tend to have strong theoretical knowledge and are able to formulate corporate green innovation strategies from the knowledge level (Mahadeo et al., 2012); members with lower education level tend to have early exposure to society, broad network resources, and rich practical experience, so they tend to be able to provide different insights from their own perspectives and increase corporate green innovation strategies.

Given that the cognitive heterogeneity of the TMT can promote the "green effect" and "innovation effect", this study concludes that when the cognitive heterogeneity of the TMT increases, companies tend to increase their green innovation behavior. Based on the inference above, the following hypotheses are proposed:

H2: TMT cognitive heterogeneity is significantly and positively related to the green innovation behavior of the firm.

H2a: Heterogeneity of education level of TMT is significantly and positively correlated with corporate green innovation behavior.

H2b: Heterogeneity of occupational background of TMT is significantly and positively correlated with corporate green innovation behavior.

2.3 Corporate Green Innovation Behavior and Socially Responsible Performance

Green innovation is innovation consisting of new or improved products, processes, services, and management that add value to customers and firms while significantly reducing adverse environmental impacts (Hojnik & Ruzzier, 2016). The traditional school of thought, based on a strict cost-benefit principle, argues that corporate environmental and social inputs have significant costs and that such corporate environmental behavior takes away from a firm's core resources. If companies cannot develop the required new capabilities in a short period of time, it is difficult to gain resource heterogeneity advantages and high performance from such green behavior (Clarkson et al., 2004). In contrast, the revisionist school, represented by Porter, argues that green behavior can fundamentally improve efficiency, reduce costs, and gain a "green premium" and competitive advantage (Driessen et al., 2013; Porter & Linde, 1995). There is no consensus on whether green innovation strategies are beneficial for the future development of companies (Dixon-Fowler et al., 2013; Eiadat et al., 2008; Le & Ferasso, 2022).

It is undeniable that some companies are reluctant to make green investments in order to avoid the uncertainty and additional costs that green innovation entails for the company. However, as social responsibility and environmental awareness increase, firms are also changing their mindset to cater to relevant stakeholders and enhance their reputation and social status (Harrison & Wicks, 2013). From the perspective of barriers to entry,

firms engaging in green innovative behavior can gain a first-mover advantage that is difficult for competitors to replicate in a short period of time, and also deters new entrants from entering. From the perspective of long-term sustainability, green innovation may have short-term costs and take up core resources, but it can fundamentally improve productivity and save costs, which in turn promotes economic efficiency and long-term sustainability (Marom, 2006; Zhu et al., 2012).

The spillover effects of green innovation have also been verified by many previous studies (Fernando et al., 2019). Green innovation strategies enable firms to reduce costs, improve processes, and innovate products through various green organizational activities, thereby enhancing their economic performance (Banerjee, 2001). Incorporating environmental concerns into the firm's strategy formulation through the implementation of green innovation can help consolidate the firm's competitive advantage (Marchi, 2010). Firms that implement green innovation strategies are able to improve their economic and social performance by improving resource utilization, developing new markets, and establishing first-mover advantages (Porter & Linde, 1995). Green innovation also helps firms to reduce environmental costs across the board, gain the trust of unique suppliers and customers, and thus seize a green competitive advantage (Chen et al., 2006; Hart, 1995).

Moreover, the purpose of green innovation is to generate good environmental benefits, not just to reduce environmental stress (Driessen et al., 2013). Therefore, green innovation is increasingly seen as an important strategy for firms to gain sustainable competitive advantage in a new arena (Fernando et al., 2019; Zhu et al., 2012). Green innovation is a key factor in reconciling economic growth and environmental protection (Banerjee, 2001). Achieving a win-win situation between economic efficiency and environmental protection is not only a common pursuit of the country and society, but also a realistic need to enhance the green competitiveness of enterprises (Huang & Li, 2017; Magat, 1978). Therefore, based on the above view, the following hypotheses are proposed:

H3: Corporate green innovation is significantly and positively correlated with CSR performance.

2.4 The Mediating Effect of Corporate Green Innovation

Based on the above inferences, we suggest that TMT cognitive heterogeneity has a positive effect on corporate green innovation behavior, and corporate green innovation behavior has a facilitative effect on corporate social responsibility performance (Orazalin & Baydauletov, 2020). Based on the upper echelons theory, this study suggests that corporate green innovation may play a mediating role between the cognitive heterogeneity of the TMT and CSR performance.

Different characteristics of TMT members may lead to different strategic choices and subsequently to different outcomes. Under the hypothesis that managers are irrational human beings, this study argues that the cognitive heterogeneity of the TMT may facilitate the occurrence of corporate green innovation behavior and subsequently corporate social responsibility performance (Huang & Li, 2017; Rodríguez-González et al., 2022). Two specific reasons may exist: 1) In the face of increasing demands for environmental protection from external stakeholders such as governments, consumers, and communities, corporate TMTs increase their attention to environmental protection and focus more on promoting corporate sustainability through the implementation of environmental strategies for the purpose of maintaining legitimacy and improving reputation and social status (Fombrun & Shanley, 1990; Karwowski & Raulinajtys-Grzybek, 2021); 2) cognitive heterogeneity allows executives to think more rationally, and the collision of ideas brings many new solutions and ideas. Heterogeneous cognition makes it easier to improve the implementation of innovative solutions, thus stimulating corporate dynamics and promoting corporate performance.

First, the heterogeneity of professional backgrounds and education levels represents the diverse life experiences and perceptions of TMT members, who are more likely to establish close ties with corporate stakeholders and to pay attention to the interests of different stakeholders (Harrison & Wicks, 2013), and are more inclined to implement environmental policies, e.g., corporate green innovation behaviors. At the same time, fitting the rights and interests of external stakeholders will enable the firm to receive support from suppliers, customers, and government (Chuang & Huang, 2018), improving the firm's reputation and social status (Chen et al., 2006). The improved social status of the firm will in turn promote further implementation of environmental policies and lead to sustainable development of the firm.

Secondly, occupational heterogeneity represents the past experience of executives, as different industries usually have different ways of thinking, and cross-industry communication and cooperation usually bring new and innovative ideas, which further develop their own cognitive level. Educational heterogeneity represents the complementary blend of theoretical knowledge and practical experience of executives (Herrmann & Datta, 2005). The heterogeneity of educational and professional backgrounds constructs different perspectives and even

divergent views of the TMT members in the decision-making process, which may be valuable resources for the team members to discuss this conflict in depth, promote innovation and creativity through reflective communication, and avoid the phenomenon of group blindness (Amason, 1996). Companies can cultivate their core competencies through innovation to improve their ability to survive in the marketplace.

In conclusion, when TMT members are highly heterogeneous, both in terms of education level and professional background, the “green effect” and “innovation effect” will promote the occurrence of green innovation behaviors, which in turn will promote the social responsibility performance of the company. Therefore, based on the inference above, the following hypotheses are proposed:

H4: Corporate green innovation behavior mediates the relationship between cognitive heterogeneity of TMT and social responsibility performance.

H4a: Corporate green innovation behavior plays a mediating role between the heterogeneity of education level of TMT and social responsibility performance.

H4a: Corporate green innovation behavior mediates between the heterogeneity of occupational background of TMT and socially responsible performance.

2.5 Moderated Mediating Effects of the Internal and External Environment

Based on the contingency theory, the strategic decisions of the TMT may also be influenced by the firm’s internal and external environment. The consciousness-behavior linkage of the state-owned enterprise (SOE) may differ from that of the non-state-owned enterprise (NSOE) (Li et al., 2018; Lopatta et al., 2017). In addition, firms’ implementation of environmental strategies may also be influenced by environmental regulation (Cai et al., 2020). It is detached from reality not to consider the boundary conditions of the research problem, so this study examines the effectiveness of strategic decision making by TMTs from the perspective of the firm’s internal and external environment.

Considering the internal environment in which firms are located, firms with different ownership types respond differently to internal and external issues (Song et al., 2014). In China, the environmental behavior of SOEs is largely driven by the requirements of government agencies. SOE shoulder certain social and livelihood issues, and do not entirely focus on economic interests as the development goal, but prefer to assume corporate social responsibility, respond to the call of national policies (Ren et al., 2019), and promote the green revolution of enterprises. SOEs also have the advantage of resources and strong financial resources to support their green innovation behavior (Li & Zhang, 2010). Compared to SOEs, NSOEs are concerned with the overall strategic development of the enterprise and may be more focused on the economic efficiency of the enterprise. Faced with the additional costs and uncertainties of green innovation, NSOEs may be reluctant to engage in green innovation behaviors and may not have the resources and capacity to support enterprises to make green investments (Marquis & Qian, 2014). Therefore, based on the above view, the following hypotheses are proposed:

H5: The mediating effect of corporate green innovation behavior on the relationship between cognitive heterogeneity of the TMT and socially responsible performance is enhanced when the firm is a SOE.

Considering the external environment in which the firm is located, environmental regulation is closely related to the growth and development of the firm and is an important factor in achieving green innovation behavior (Yu et al., 2022). Previous research has shown that external corporate pressures such as environmental regulations can influence the choice of environmental strategies by corporate executives and the performance of the firm (Majid et al., 2020). Specifically, in order to gain good corporate reputation and social status (Chen et al., 2006), firms send signals of their environmental achievements to key stakeholders, e.g., their green innovation behavior, other investments in the environment, etc. By doing so, firms can avoid potential penalties, gain legitimacy (Fombrun & Shanley, 1990; Wei et al., 2017), as well as reap social and economic benefits. When environmental regulation is strong, it represents a higher state emphasis on environmental protection, and for various purposes, firms may increase their investments in green innovation practices (Leiter et al., 2011), which subsequently affects their socially responsible performance. Conversely, when environmental regulation is weak, it represents a lack of focus on environmental protection by external stakeholders, and firms are reluctant to sacrifice their core corporate resources to make green investments (Zhou et al., 2020). Based on the inference above, the following hypotheses are proposed:

H6: The mediating effect of corporate green innovation behavior on the relationship between cognitive heterogeneity of TMTs and socially responsible performance is enhanced when environmental regulation is stronger.

Based on the literature review and research hypothesis, the research framework (Figure 1) constructed for this study is as follows.

3. Study Design

3.1 Research Sample and Data Sources

In this paper, we use annual data of Chinese manufacturing companies listed in Shanghai and Shenzhen A-shares during the period of 2015-2021. There are two reasons for selecting this dataset in this paper. First, on January 1, 2015, the new “Environmental Protection Law of the People’s Republic of China”, known as the strictest in history, was officially implemented. The government attaches great importance to environmental protection, public awareness of environmental protection has been raised, and managers within companies are also becoming concerned about the impact of policy releases on the natural environment and take relevant actions. Secondly, as one of the sources of pollution, manufacturing enterprises are not only the key monitoring targets for pollution prevention and control, but also important carriers for promoting green innovation and greening production methods, and the needs of manufacturing enterprises in green transformation and green innovation are particularly urgent (Le & Ferasso, 2022; Yu et al., 2022).

The green innovation data used in this study are obtained from the State Intellectual Property Office (SIPO) of the People’s Republic of China, and other economic data are obtained from the CSMAR database, WIND database and collected manually. The collected data are processed as follows: ST and *ST listed companies are removed; listed companies with incomplete or severely missing research data are removed; to eliminate the effect of sample outliers, all continuous variables are shrunk at the 99% and 1% quartiles in this paper; considering the lag of the influence of executive characteristics, this paper treats the observation time of CSR performance with a one-period lag and finally obtains 489 enterprises with 2445 annual observations.

3.2 Variable Definition and Measurement

3.2.1 Cognitive Heterogeneity of the TMT

According to existing studies (Hambrick & Mason, 1984; Murtha et al., 1998), the TMT is defined by combining the information of senior managers disclosed in the annual reports of each company, including: members of the board of directors, members of the supervisory board, general manager, president, executive (or first) vice president, executive (or first) vice president, chief financial officer (or person in charge of finance), technical director, chief engineer, chief economist, chief agronomist, secretary of the board of directors, secretary of the party committee and other senior managers who hold management positions. In addition, this paper defines cognitive heterogeneity as a focus on the variability between the knowledge bases (including knowledge and experience) of team members, in conjunction with the research of Arazy and other scholars (Arazy et al., 2011). Cognitive heterogeneity of TMTs involves two dimensions, “educational level heterogeneity” and “professional background heterogeneity” (Hambrick et al., 1996), which are defined as follows.

(1) Educational level heterogeneity (H_{edu}). The education level of the TMT members is classified into five levels: high school and below, university college, bachelor’s degree, master’s degree, doctorate and above (Zhou et al., 2021), and assigned values of 1, 2, 3, 4 and 5, respectively. The Herfindal-Hirschman index (Blau, 1977) is used to measure the educational level heterogeneity of TMT (Carpenter, 2002), and calculated as $H = 1 - \sum_i p_i^2$. H represents heterogeneity with a value between 0 and 1, and P represents the percentage of TMT members in each education level category i . When the value of H is higher, heterogeneity is stronger.

(2) Occupational background heterogeneity (H_{occ}). The occupational background of TMT members is classified into nine categories: production, R&D, design, human resources, management, marketing, finance, finance, and law, and assigned values. Heterogeneity is calculated as above (Hambrick et al., 1996; Mooney & Sonnenfeld, 2001). The higher the H value, the stronger the heterogeneity.

3.2.2 Corporate Green Innovation (In_{Evn})

In 2010, the World Intellectual Property Organization (WIPO) launched an online tool to facilitate the retrieval of patent information related to environmentally friendly technologies, the “International Patent Classification Green List”, which classifies green patents into seven categories based on the United Nations Framework Convention on Climate Change. In this paper, the number of green patents applied by listed companies in the sample is identified and accounted for according to the above classification criteria, and the logarithm of the number of green patents applied by listed companies in the sample is selected as the object of analysis, based on existing research methods (Dosi et al., 2006; Hall & Harhoff, 2012; Tong et al., 2014).

3.2.3 Corporate Social Responsibility Performance (CSRP)

In this paper, from the perspective of stakeholders (Yi et al., 2022), a CSR index evaluation system is constructed in three dimensions: economic, social and environmental. The indexes are synthesized by using principal component analysis, and finally a comprehensive CSR performance index is obtained.

3.2.4 Ownership Type (T_{own})

Drawing on existing research methods (Ren et al., 2019), this paper divides the sample companies into two categories: SOE and NSOE. Firms are assigned a value of 1 if they are SOEs and 0 if they are not.

3.2.5 Environmental Regulation (PITI)

Measured by the PITI index score of the company's place of registration (Aragon-Correa et al., 2020). Higher PITI index indicates more comprehensive and transparent information disclosure and stronger environmental regulation in the city; conversely, lower PITI index score represents weaker environmental regulation.

3.2.6 Control Variables

To eliminate the effects of other factors on CSR performance, control variables are introduced in our model based on previous studies (Galletta et al., 2022; Lee et al., 2021; Orazalin & Baydauletov, 2020), including firm size, firm age, board size, board structure, shareholding concentration, shareholding balance, and management shareholding. Firm size (Size), measured as the natural logarithm of total annual assets, is known to vary widely across firms of different sizes in terms of their willingness and ability to fulfill social responsibility. Firm age (FirmAge), measured as the natural logarithm of the current year of the firm minus the year of its establishment plus one, has shown that firm age affects corporate social responsibility performance by influencing the institutionalization of corporate governance. Board size (Board), measured as the natural logarithm of the number of board members. Board structure (Indep), measured as the number of independent directors divided by the number of board members. Shareholding concentration (Top1), measured as the percentage of shares held by the largest shareholder divided by the total number of shares. Shareholding Balance (Balance), measured as the sum of the shareholding of the second to fifth largest shareholder divided by the shareholding of the first largest shareholder. In China, shareholders and directors occupy a pivotal position and influence the strategic decisions of executives so that must be controlled. Management shareholding (Mshare), measured as the number of management shares divided by total equity, reflects the extent of management's power and control over the firm's influence, which affects the fulfillment of its social responsibility so that must be controlled. In addition, the study controls for firm industry and year fixed effects.

3.3 Construction of CSR Performance Index Evaluation System

After entering the 21st century, with the emergence of a series of problems such as environmental pollution, product quality, and delinquent wages of migrant workers, the government, the business community and academia have paid more and more attention to social responsibility. The evaluation of corporate performance should not only be based on the economic performance in the neoclassical economics model, but also on the performance that can characterize the future development prospect of the company and bring sustainable competitive advantage (Arundel & Kemp, 2009). Companies should not only measure the effectiveness of their behavior by profit, but also consider the impact of their behavior on the welfare of the whole society (Carroll, 1991; Wood, 1991). The synergistic development of economic performance with environmental and social performance allows a better assessment of whether a firm meets sustainability requirements: on the one hand, by creating economic performance it can improve the firm's ability to compete in the market (Driessen et al., 2013); on the other hand, it explains the firm's ability to provide products or services based on technologies that reduce environmental burdens or even generate environmental benefits (Alexopoulos et al., 2018).

Considering that CSR emerged to provide sustainable economic, environmental and social values to the internal and external stakeholders of the organization (Fonseca et al., 2021; Sharma & Vredenburg, 1998). Effective assessment of CSR performance is the basis for stakeholders to understand the level of CSR fulfillment (Yi et al., 2022), so this study constructs a CSR performance indicator evaluation system based on stakeholder theory with 20 sub-indicators in three dimensions: economic, social and environmental, as shown in the table1 below.

The development and operation capability of enterprises can be mainly divided into solvency, operation capability, profitability and development capability, while the performance of enterprises in the market is also valued by the key stakeholders of enterprises. Thus, this study selects key indicators based on the above aspects, while these five aspects can be a comprehensive measure of the economic level of the enterprise, representing the benefits of key stakeholders of the enterprise such as: shareholders and creditors. Both creditors and shareholders are investors of the enterprise, and the best return to investors and the fulfillment of responsibilities

to shareholders and creditors is only if the enterprise can win huge profits and achieve sustainable growth of economic benefits.

Stakeholder theory suggests that in order to gain legitimacy and good reputation in the development process (Zhang et al., 2018), firms must have to take into account the benefits of more distal stakeholders, such as: reducing pollution to the environment, increasing job opportunities, and paying taxes according to the law, in order to improve social well-being. Therefore, this study also focuses on the contributions made by firms to society and the environment. In this paper, five indicators, namely annual per capita income, employee development, job opportunities, asset tax rate, and legal rate, are selected to measure the contributions made by enterprises to society. Among them, annual per capita income and employee development guarantee the legal rights and interests of employees, and the higher the index, the better the welfare of employees of the enterprise; at the same time, enterprises create jobs and provide employment opportunities for society, and also help the government solve the employment problem; paying taxes according to the rules is an enterprise's responsibility and obligation; complying with the law and operating in compliance are the bottom line of enterprises and the basic requirements of the state for enterprises. In this paper, the sustainability rate is selected as an indicator of the rights and interests of enterprises to protect the environment. The higher the sustainability rate, the better the environmental awareness of enterprises and the better the fulfillment of their environmental responsibilities.

Finally, this study uses principal component analysis (PCA) (Zhang et al., 2022) through SPSS software to synthesize a comprehensive score of CSR performance to scientifically measure the future development prospects of enterprises.

Table 1. Corporate social responsibility performance index evaluation system

Indicators	Sub-indicators	Definition
solvency	current ratio	current assets/current liabilities
	quick ratio	(current assets - inventory)/current liabilities
	asset-liability ratio	total liabilities / total assets
	accounts receivable	operating income / (closing balance of accounts receivable + opening balance of accounts receivable) / 2
operating capacity	turnover ratio	Operating costs / (ending balance of inventories + opening balance of inventories) / 2
profitability	inventory turnover ratio	operating income / (total assets closing balance + total assets opening balance) / 2
	total assets turnover ratio	(total profit + finance costs) / (total assets ending balance + total assets opening balance) / 2
	ROA	net income / (ending balance of shareholders' equity + opening balance of shareholders' equity) / 2
Economy	ROE	
	total assets growth rate	(total assets closing value for the period - total assets opening value for the period) / (total assets opening value for the period)
development capability	operating income growth rate	(operating income for the current year - operating income for the same period of the previous year) / (operating income for the same period of the previous year)
	net assets growth rate	(current period-end amount of owner's equity - current period-end amount of owner's equity) / current period-end amount of owner's equity
market value	Tobins' Q	market value A / (total assets - net intangible assets - net goodwill)
	PE	current value of current closing price / (net income previous year's annual value / paid-in capital current period end value)
	PB	current closing price current period value / (total owner's equity ending value / paid-in capital current period ending value)
social	annual per capita income	annual per capita income
	employee development	new employees' compensation payable for the year / employees' compensation payable at the beginning of the year.
	employment opportunities	number of new employees for the year / number of employees at the beginning of the year
	asset tax rate	all taxes paid/total assets
	legitimacy rate	the enterprise legal rate is measured by the number of violations, if the number of violations is 0, the enterprise legal rate is assigned to 1; if not, the formula is substituted, legal rate = $\ln(1/\text{number of corporate violations} + 1)$
environment	sustainable development rate	return on net assets * earnings retention rate / (1 - return on net assets * earnings retention rate)

3.4 Analytical Approach

To examine whether corporate green innovation mediates the relationship between cognitive heterogeneity of TMTs and CSR performance (Shakil, 2021), this paper uses a stepwise regression method to investigate the correlation using the mediation effect test procedure recommended by Baron and Kenny (1986). In addition, this study also uses the non-parametric percentile Bootstrap method with stronger test power for bias correction.

4. Results

4.1 Descriptive Statistics and Correlation Analysis of Variables

Table 2 includes the mean, SD, and correlation coefficient of each variable. Heterogeneity in educational level of TMT and heterogeneity in professional background of TMT are negatively correlated with CSR performance ($r=-0.01$, $p>0.1$; $r=-0.05$, $p<0.05$); in addition, both heterogeneities are positively correlated with corporate green innovation behavior ($r=0.047$, $p<0.05$; $r=0.084$, $p<0.01$); green innovation behavior is positively but not significantly related to CSR performance ($r=0.027$, $p>0.1$). This preliminary result is partially consistent with our hypothesis. In addition, the correlation coefficients between the variables are relatively low. The study also assessed the variance inflation factor (VIF) values, and no significant multicollinearity is found in the model.

Table 2. Descriptive statistics and correlation analysis

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
1.CSRP	0.00519	0.248	1												
2.H_edu	0.4	0.236	-0.01	1											
3.H_occ	0.699	0.0782	-0.050**	0.175***	1										
4.In_Evn	0.612	1.019	0.027	0.047**	0.084***	1									
5.PITI	61.31	12.11	0.006	0.037*	0.02	0.083***	1								
6.T_own	0.321	0.467	-0.065***	-0.207***	0.012	0.042**	-0.172***	1							
7.Size	22.54	1.191	0.013	-0.044**	0.039*	0.321***	0.037*	0.256***	1						
8.Board	2.124	0.187	-0.054***	-0.063***	-0.01	0.002	-0.056***	0.219***	0.217***	1					
9.Indep	0.376	0.0564	0.018	0.001	0.002	0.060***	-0	0.024	0.043**	-0.496***	1				
10.FirmAge	2.972	0.268	-0.034*	-0.228***	-0.03	-0.035*	-0.02	0.273***	0.120***	0.172***	-0.01	1			
11.Top1	0.337	0.135	0.071***	-0.044**	0.01	0.013	0.024	0.166***	0.138***	-0.02	0.081***	-0.02	1		
12.Balance	0.711	0.579	0.029	0.090***	0.01	-0.01	0.061***	-0.223***	-0.02	0.029	-0.046**	-0.046**	-0.712***	1	
13.Mshare	0.126	0.18	0.052***	0.213***	0.054***	-0.039*	0.059***	-0.440***	-0.289***	-0.212***	0.044**	-0.234***	-0.105***	0.224***	1

Note. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

4.2 Regression Results

4.2.1 Direct and Mediating Effects

The results of the hierarchical regression analysis are shown in Table 3. Model 3 examines the effect of control variables on CSR performance, while models 4 and 6 introduce heterogeneity in education level and heterogeneity in occupational background of the TMT respectively on the basis of control variables. The empirical results show that both heterogeneities show a negative relationship with CSR performance ($r=-0.0429$, $p<0.05$; $r=-0.118$, $p<0.1$), so hypothesis 1 is not tested. Models 1 and 2 show that educational level heterogeneity and occupational background heterogeneity are significantly and positively related to corporate green innovation ($r=0.243$, $p<0.01$; $r=0.694$, $p<0.01$), so hypothesis 2 is verified. Based on model 4 and model 6, mediating variables are introduced, model 5 and model 7 showed that corporate green innovation is significantly and positively related to CSR performance ($r=0.0132$, $p<0.01$; $r=0.0131$, $p<0.01$), so hypothesis 3 is verified.

Based on the empirical results in Table 3, in terms of the total effect, the cognitive heterogeneity of the TMT inhibits the CSR performance, but the cognitive heterogeneity of the TMT also positively influences the CSR performance by stimulating corporate green innovation. The positive indirect effect exerted by corporate green innovation weakens the negative effect of the direct effect of cognitive heterogeneity of the TMT, indicating that corporate green innovation is specifically represented in the mediation model as a masking effect, so Hypothesis 4 partially holds.

To examine the robustness of the masking effect, this study further tests the “TMT cognitive heterogeneity-corporate green innovation-corporate social responsibility performance” using the bias-corrected non-parametric percentile Bootstrap method with stronger test power, and sets the sample size at 1000, and the test results are shown in Table 5. Panel A is the independent variable as a mediated test of heterogeneity in the

education level of the TMT. The results indicate that in the indirect effect, the 95% confidence interval is [0.0005, 0.0069], and the 95% bias-corrected confidence interval is [0.0006, 0.0072]; relatively, in the direct effect, the 95% confidence interval is [-0.0898, -0.0065], and the 95% bias-corrected confidence interval is [-0.0911, -0.0082]. Panel B is a mediated test of heterogeneity of the independent variables for the occupational background of the TMT. The results indicate that in the indirect effect, the 95% confidence interval is [0.0011, 0.0197] and the 95% bias-corrected confidence interval is [0.0023, 0.0214]; relatively, in the direct effect, the 95% confidence interval is [-0.2458, -0.0009] and the 95% bias-corrected confidence interval is [-0.2486, -0.0085]. None of the above confidence intervals contain 0, indicating that the masking effect results are robust. In addition, Sobel tests are also performed on the above results, and the results are all consistent and significant. This also provides further support for hypothesis 4.

Table 3. Regression analysis of cognitive heterogeneity of TMT on CSR performance

	In_Evn				CSR P		
	M1	M2	M3	M4	M5	M6	M7
Independent variable							
H_edu	0.243*** (0.0870)			-0.0429** (0.0215)	-0.0461** (0.0215)		
H_occ		0.694*** (0.252)				-0.118* (0.0632)	-0.127** (0.0633)
Mediator variable							
In_Evn					0.0132*** (0.00498)		0.0131*** (0.00498)
Control variable							
Size	0.293*** (0.0230)	0.293*** (0.0229)	0.00872* (0.00476)	0.00910* (0.00474)	0.00525 (0.00499)	0.00897* (0.00478)	0.00513 (0.00501)
Board	-0.110 (0.134)	-0.109 (0.133)	-0.0901** (0.0355)	-0.0897** (0.0354)	-0.0883** (0.0354)	-0.0900** (0.0355)	-0.0885** (0.0355)
Indep	0.806** (0.385)	0.804** (0.386)	-0.119 (0.105)	-0.120 (0.105)	-0.130 (0.104)	-0.119 (0.105)	-0.130 (0.104)
FirmAge	-0.0891 (0.0862)	-0.116 (0.0851)	0.0227 (0.0209)	0.0157 (0.0212)	0.0169 (0.0210)	0.0206 (0.0208)	0.0221 (0.0206)
Top1	-0.549*** (0.211)	-0.566*** (0.211)	0.300*** (0.0538)	0.300*** (0.0537)	0.307*** (0.0534)	0.303*** (0.0538)	0.310*** (0.0534)
Balance	-0.124*** (0.0472)	-0.124*** (0.0469)	0.0581*** (0.0131)	0.0586*** (0.0131)	0.0602*** (0.0130)	0.0586*** (0.0131)	0.0602*** (0.0130)
Mshare	0.132 (0.107)	0.152 (0.105)	0.0189 (0.0333)	0.0266 (0.0334)	0.0248 (0.0334)	0.0229 (0.0333)	0.0209 (0.0333)
PITI	0.00457*** (0.00162)	0.00472*** (0.00163)	0.000523 (0.000459)	0.000526 (0.000458)	0.000466 (0.000457)	0.000500 (0.000458)	0.000438 (0.000457)
T_own	-0.00179 (0.0508)	-0.0197 (0.0508)	-0.0270** (0.0126)	-0.0292** (0.0128)	-0.0292** (0.0128)	-0.0261** (0.0125)	-0.0258** (0.0125)
year	control	control	control	control	control	control	control
industry	control	control	control	control	control	control	control
Constant	-6.333*** (0.610)	-6.630*** (0.638)	-0.114 (0.148)	-0.0842 (0.149)	-0.000819 (0.154)	-0.0346 (0.148)	0.0524 (0.153)
Observations	2,445	2,445	2,445	2,445	2,445	2,445	2,445
R-squared	0.181	0.181	0.046	0.048	0.050	0.048	0.050

Note. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

4.2.2 Moderated Mediating Effect of Internal and External Environment

Based on Table 3, after controlling for the mediating variable-firm green innovation, the cross product term of the independent and moderating variables is introduced to test the moderated mediating effect (Wen & Ye, 2014), and the empirical results are shown in Table 4. Models 8 and 10 indicate that educational level heterogeneity is significantly and positively moderated by environmental regulation ($r=0.00341$, $p<0.05$), while occupational background heterogeneity is not significant ($r=0.00349$, $p>0.1$), so hypothesis 6 partially holds. Models 9 and 11

indicate that both educational level heterogeneity and occupational background heterogeneity are significantly and positively moderated by the nature of firm ownership ($r=0.0857$, $p<0.05$; $r=0.0258$, $p<0.05$), so hypothesis 5 holds.

Table 4. Moderated mediation analysis of T_own and PITI

	CSRP			
	M8	M9	M10	M11
Independent variable				
H_edu	-0.255** (0.104)	-0.0768*** (0.0280)		
H_occ			-0.339 (0.309)	-0.230*** (0.0882)
Moderator variables				
T_own	-0.0290** (0.0127)	-0.0595*** (0.0197)	-0.0265** (0.0127)	-0.206** (0.0842)
PITI	-0.000709 (0.000753)	0.000475 (0.000456)	-0.00199 (0.00356)	0.000344 (0.000462)
Interaction effects				
H_edu*PITI	0.00341** (0.00164)			
T_own *H_edu		0.0857** (0.0426)		
H_occ*PITI			0.00349 (0.00502)	
T_own *H_occ				0.258** (0.120)
Mediator variable				
In_Evn	0.0129*** (0.00497)	0.0129*** (0.00497)	0.0131*** (0.00498)	0.0134*** (0.00499)
Control variable				
Size	0.00546 (0.00501)	0.00517 (0.00499)	0.00501 (0.00502)	0.00504 (0.00500)
Board	-0.0896** (0.0353)	-0.0913*** (0.0353)	-0.0881** (0.0355)	-0.0902** (0.0354)
Indep	-0.138 (0.104)	-0.133 (0.105)	-0.129 (0.105)	-0.137 (0.105)
FirmAge	0.0189 (0.0210)	0.0154 (0.0211)	0.0222 (0.0206)	0.0219 (0.0207)
Top1	0.307*** (0.0533)	0.311*** (0.0536)	0.310*** (0.0534)	0.306*** (0.0534)
Balance	0.0601*** (0.0130)	0.0601*** (0.0130)	0.0601*** (0.0130)	0.0605*** (0.0130)
Mshare	0.0241 (0.0334)	0.0285 (0.0335)	0.0210 (0.0333)	0.0220 (0.0333)
year	control	control	control	control
industry	control	control	control	control
Constant	0.0686 (0.155)	0.0249 (0.154)	0.202 (0.266)	0.138 (0.155)
Observations	2,445	2,445	2,445	2,445
R-squared	0.052	0.052	0.050	0.051

Note. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5. Robustness testing: bias-corrected nonparametric percentile Bootstrap method

	Panel A						
	Observed Coef.	Bootstrap Std. Err.	Z	P [95% Conf. Interval]		BC [95% Conf. Interval]	
Indirect effects	0.0032	0.0017	-1.89*	0.0005	0.0069	0.0006	0.0072
Direct effects	-0.0461	0.0215	-2.14**	-0.0898	-0.0065	-0.0911	-0.0082
	Panel B						
	Observed Coef.	Bootstrap Std. Err.	Z	P [95% Conf. Interval]		BC [95% Conf. Interval]	
Indirect effects	0.0091	0.0047	1.94*	0.0011	0.0197	0.0023	0.0214
Direct effects	-0.1273	0.0630	-2.02**	-0.2458	-0.0009	-0.2486	-0.0085

Note. Panel A is a mediation test for heterogeneity in education level of the TMT, and Panel B is a mediation test for heterogeneity in occupational background of the TMT. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

5. Discussion and Conclusion

5.1 Discussion

This study constructs a CSR performance indicator evaluation system based on stakeholder theory from three dimensions: economic, social and environmental. In addition, the bridging role played by corporate green innovation behavior in the relationship between the cognitive heterogeneity of the TMT (including heterogeneity of education level and occupational background) and CSR performance. And the moderating role of corporate ownership type and environmental regulation are also explored. The empirical analysis is conducted on the data of Shanghai and Shenzhen A-share listed manufacturing companies from 2015-2021, and the results are as follows.

First, in terms of total effects, TMT cognitive heterogeneity does not promote but inhibits CSR performance. Although TMT cognitive heterogeneity brings diverse perceptions to firms and promotes rational decision making of executives, to a large extent, executive personnel characteristics are a double-edged sword. Heterogeneity may lead to task conflict and emotional conflict among TMT members (Lee et al., 2021; Li & Huang, 2019), increasing the cost of their communication and decreases team cohesion. The competitive environment of manufacturing industry requires more TMT members to make rapid decisions and respond to various crises and emergencies faced by the company in a timely manner. Excessive heterogeneity will lead to increased internal consumption and affect the efficiency of decision making and corporate social performance improvement.

Secondly, the positive indirect effect of corporate green innovation weakens the negative effect of the direct effect of TMT cognitive heterogeneity by stimulating corporate green innovation behavior, which is manifested as the masking effect. Corporate green innovation behavior mediates the promotion of CSR performance by the cognitive heterogeneity of the TMT, but the positive promotion effect of the indirect effect is much smaller than the negative suppression effect of the direct effect. This suggests that Chinese firms' green innovation behaviors are superficial and the degree of substantive green innovation is insufficient (Schons & Steinmeier, 2016), and to some extent there is a problem of formalization of green innovation, which leads to green innovation behaviors not playing a good effect (Zhou et al., 2020).

Finally, the masking effect of corporate green innovation on the relationship between cognitive heterogeneity of the TMT and CSR performance is significantly and positively moderated both when the type of corporate ownership is SOEs and when external environmental regulations are stronger. This suggests that SOEs are more likely to implement environmental strategies such as improving green innovation behavior and investing in environmental protection to achieve sustainable development and higher CSR performance. With support from the government and strong financial resources (Li & Zhang, 2010), SOEs have the obligation to increase social well-being on the one hand, and sufficient resources and capacity to deal with the risks and uncertainties associated with the implementation of green innovation practices by enterprises on the other. In contrast, compared to SOEs, NSOEs may not have sufficient motivation and capacity to promote their development through green innovation. However, when the pressure from the external environment becomes greater, i.e., the greater the environmental regulation, both SOEs and NSOEs will increase their attention to corporate environmental strategies in order to gain legitimacy and win a better reputation and social status, so that enhance their socially responsible performance and achieve sustainable development.

5.2 Theoretical and Research Contributions

First, compared with the previous practice of examining corporate development only from financial performance (Yi et al., 2022), this study constructs an evaluation system of CSR performance indicators from three dimensions: economic, social and environmental, which is more in line with the requirements of corporate stakeholders and closer to the national conditions and future development prospects of modern Chinese enterprises. At the same time, it also confirms that corporate goals are changing from maximizing corporate value to maximizing stakeholder value; unlike the discussion of green performance or environmental performance, the integrated consideration of financial and non-financial indicators is more relevant to the overall development plan of the company and more realistic scenarios. It is impossible for a company to go green and develop at the expense of economic interests.

Second, research on the impact of TMT heterogeneity has been a research hotspot in the field of strategic management, and this study considers the impact of deeper heterogeneity, i.e., cognitive heterogeneity, on corporate behavioral performance. The contribution of this study to this area of research is to clarify the impact of cognitive heterogeneity of TMTs on corporate social responsibility performance in the unique cultural context of China, which has been rarely addressed and the findings are not clear (Olthuis & Oever, 2020). The study also establishes a theoretical and empirical link between these three relationships based on the “green effect” and the “innovation effect” of green innovation behavior. The study also takes into account the influence of the internal and external environment of enterprises in order to be close to reality.

Finally, based on the “spillover effect” of green innovation, this study explains the counter-intuitive phenomenon of Chinese enterprises’ reluctance to engage in green innovation. Chinese firms are currently at a stage where the legal framework for punishing unethical behavior is weak and the cost of unethical behavior is low. Substantial green innovation behavior is costly and uncertainty of output benefits is high. Companies lack sufficient resources to support the existence of formalized green innovation behavior in order to gain legitimacy (Shu et al., 2016).

5.3 Management Implications

First, the CSR indicator evaluation system constructed in this study is in line with the sustainable development goals of enterprises, not only pursuing the interests of internal stakeholders, but also taking into account the interests of external or more distant stakeholders (Arayakarnkul et al., 2022). It provides investors with information on whether the company is worth investing in through a comprehensive consideration of various aspects, which is conducive to safeguarding investors’ rights and interests. It also provides a reasonable assessment of the future development potential of the company and helps to clarify the future direction of the company.

Secondly, this study provides a theoretical basis for enterprises to form a reasonable TMT. Companies can train or hire executives who share the same values and perceptions, which helps to promote communication and collaboration among executives in their daily work, enhance corporate cohesion, and avoid conflicts and contradictions arising from excessive differences in the characteristics of executives to hinder the achievement of common wishes. At the same time, the empirical results of this study show that the cognitive heterogeneity of the TMT is not either high or low, so the value of heterogeneity cannot be completely denied. A certain degree of cognitive heterogeneity of the TMT will promote the green innovation behavior of the enterprise. And in the context of SOE ownership and strong environmental regulations, this green innovation can contribute significantly to CSR performance. Therefore, an inclusive corporate value culture should be shaped, and individual heterogeneity of executives should be tolerated and respected to a certain extent.

Finally, this study also confirms the need and importance of the state to encourage green behavior. There is a spillover effect of corporate green innovation behavior (Porter & Linde, 1995). That is to say, companies make green innovation and environmental protection investments, which do not simply bring an increase in governance costs to the company. In the short term, the interests of internal stakeholders may be sacrificed, but in the long term, the spillover effect generated by green investment will promote the common enhancement of the interests of internal and external stakeholders. In the future, the government should actively guide enterprises from passive acceptance to spontaneous and active implementation of substantive green innovation behaviors of enterprises, and at the same time increase efforts to develop incentives and penalties for environmental impacts, requiring enterprises to conduct more substantive green innovation activities. In addition, it is also important to actively and effectively communicate with NSOEs to help them meet the challenges of implementing green innovation behaviors by providing necessary training and resource support (Zhou et al., 2020).

5.4 Research Limitations and Future Directions

Although this study is conducted rigorously, there are some limitations. First, the upper echelons theory provides an appropriate theoretical basis to explain the impact of executive characteristics on the strategic decisions of firms and their performance (Hambrick et al., 1996). In addition to the heterogeneity of the educational level and professional backgrounds of the TMT considered in this study, cognitive heterogeneity of the TMT derived from other knowledge bases may also influence the future development of the firm.

Second, this study only considers the impact of executive traits alone on firm development, ignoring the impact of interactions between different knowledge sources on the firm. The TMT faultlines study the communication and interaction between corporate executives and each other, which is dynamic in nature. In the future, we may consider studying whether the TMT faultlines affect corporate green innovation behavior, and then whether they affect CSR performance.

Third, this study shows that corporate green innovation behavior positively contributes to the relationship between TMT cognitive heterogeneity and CSR performance, and to some extent masks the negative effects of excessive heterogeneity. This study suggests that perhaps there are other mediating mechanisms that contribute to the negative effects of TMT cognitive heterogeneity, which deserve further exploration in the future.

Finally, this study limits the analysis to five years of data from 2015 to 2020. As such, it does not show the long-term impact of corporate green behavior on firm development, and more comprehensive longitudinal studies may be needed in the future. We suggest that future research should explore whether there are differences in the relationships between the cognitive characteristics of TMTs, corporate green innovation behavior, and CSR performance under conditions of short-term stability and long-term instability.

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