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Article

Can talent policy promote green technology innovation?

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Abstract

Talent policy is conducive to attracting, motivating, and retaining vital, innovative talents to provide continuous motivation and innovation for green development. However, there is a dearth of literature on the impact of talent policy on enterprises' green technology innovation (GTI). To bridge this gap, we take China's A-share listed enterprises from 2010 to 2021 as samples, construct a Poisson model to test the relationship between talent policy and GTI, and further reveal the mechanism of executive environmental attention on the relationship between them. The research results are: (1) Talent policy significantly promotes GTI. After a series of tests, this positive effect is robust. (2) Executive environmental attention mediates this relationship. (3) The positive impact of talent policy is more significant in heavy polluting enterprises and non-state-owned enterprises, as well as in the power sector. These findings enrich the literature on incentive policy and GTI and have important practical implications for enterprises and policymakers.

Keywords: talent policy; green technology innovation; environmental attention; Poisson model.

1. Introduction

Environmental problems such as global climate variability, resource depletion, and environmental pollution have aroused broad concern. In this era of increasing challenges, environmental protection, sustainable development, and green development have become everyday concerns of governments, enterprises, and society (Rennings 2000; Liu et al. 2022). Global action is needed to achieve green development, especially in reducing carbon emissions, lowering resource consumption, and improving environmental quality. In this context, it has become an urgent task to promote green technologies and innovations that can help solve environmental problems, enhance energy efficiency, lower carbon footprints, and achieve sustainable use of resources. Enterprise green technology innovation (GTI) refers to the adoption by enterprises of new or improved technologies in their products, services, production processes, or management methods to reduce the negative impact on the environment (Rennings 2000; Wang and Yu 2021; Huang et al. 2023; Yang et al. 2023).

However, companies must have sufficient innovation capacity, technical knowledge, and resources to succeed in GTI. Among them, talent is considered to be the critical factor in promoting GTI, possessing the professional knowledge and skills needed to develop and apply green technology, providing enterprises with innovation capability and strategic guidance (Murphy, Shleifer and Vishny 1991; Bruderl, Preisendorfer and Ziegler 1992; Huang et al. 2023; Yang et al. 2023). In December 2021, the Central Talent Conference proposed that talent is the key to independent innovation and national development depends on talent. In October 2022, the Party's 20th Report pointed out that talent is the first resource and innovation is the first driving force. In the same month, the central government issued a guideline on strengthening the team of highly skilled Talents in the New Era.

At the same time, the government holds a significant guiding and supporting role in sustainable development and environmental protection (Chen, Sun and Wang 2023). The government promotes GTI through various policies and measures, including financial incentives, regulatory support, and market-oriented and talent policy. The talent policy, as part of this, aims to promote science and technology development and innovation by introducing, cultivating, and retaining high-quality talents (Cerna and Chou 2019; Jacobs 2020; Shen and Li 2020; Marini and Yang 2021; Yu and Du 2023; Zhang, Qu and Gao 2023). These policies include high-tech talent introduction programs, scholarships for scientific researchers, and university cooperation programs. However, there is insufficient understanding of how talent policy affects GTI.

In the current research, based on signal theory and institutional theory, the influence of various policy incentive tools on enterprises' GTI has been widely studied and analyzed (Liao 2018). For example, carbon trading policies have effectively promoted GTI (Borghesi, Cainelli and Mazzanti 2015; Liu et al. 2022). The promotion effect of environmental subsidies on enterprises' environmental management innovation and technological innovation has also been supported by empirical studies (Bai et al. 2019; Yang et al. 2023; Han et al. 2024) and fiscal and tax policies and green credit policies also exert a beneficial influence on improving GTI (Huang, Liao and Li 2019; Hu, Wang and Wang 2021; Wang and Yu 2021; Liao, Xu and Zhang 2024; Wei, Wang and Xia 2024). In addition, the effect of policy uncertainty on GTI behavior has also attracted scholars' attention (Bai et al. 2023). These studies provide valuable insights and evidence for understanding and promoting corporate GTI.

However, there is little literature on the impact of talent policy on GTI. This is a significant research gap because talent is an indispensable resource in innovation activities. On the one hand, the existing literature mainly focuses on finance

(Bai et al. 2019; Yang et al. 2023; Han et al. 2024), Taxation (Wang and Yu 2021; Wei, Wang and Xia 2024), Environmental policy (Demirel and Kesidou 2011; Borghesi, Cainelli and Mazzanti 2015; Liu et al. 2022), but there is limited discussion on how to promote GTI through talent policy directly. On the other hand, few studies have pointed out that talent policy beneficially affects general innovation (Zhang, Liu and Yang 2021; Chen, Sun and Wang 2023; Zhang, Qu and Gao 2023). For example, Zhang, Qu and Gao (2023) take Chinese solar photovoltaic enterprises as samples and find that talent policy positively affects enterprise innovation. Similarly, Chen, Sun and Wang (2023), grounded in empirical data from publicly traded companies, adopted the multidimensional regression method and reached the same conclusion. In addition, Zhang, Liu and Yang (2021) found that the government's support for talent policy significantly promoted employees' innovative attitudes. However, in the field of green development, we do not know whether the support of talent policy contributes positively to GTI. In addition, how to stimulate the vitality of GTI in enterprises through talent policy, improve the quality and efficiency of GTI, and design an effective talent policy to support green transformation have not been fully explored. As a result, we have an insufficient understanding of the role and potential of talent policy in promoting GTI in enterprises, and we cannot fully leverage human resources' contribution to environmental sustainability.

In the context of the current global environmental challenges and the need for green transformation, exploring the mechanisms by which government talent policy at the macro level affects micro-corporate GTI behavior can not only fill the gaps in the existing literature but also guide policymakers to design policies that promote talent development and support environmental sustainability objectives. Therefore, we selected Shanghai-Shenzhen A-share listed companies from 2010 to 2021 as samples, studied the relationship between talent policy and corporate GTI, and explored the driving mechanism of the impact of executive environmental attention on their relationship.

This research significantly enriches the academic field from various perspectives. Firstly, our research introduces a novel perspective for enhancing GTI. Previous studies on the influence of external institutional factors on GTI have primarily focused on environmental laws and policies (Cai et al. 2020; Rennings 2000; Liu, Xu and Chen 2024), economic incentives and subsidies (Bai et al. 2019; Huang, Liao and Li 2019; Han et al. 2024), as well as market access and green standards (Ren et al. 2021; Xu et al. 2022). However, scant attention has been paid to the impact of talent cultivation and development policies on GTI. Our research fills this gap by unveiling the positive relationship between government talent policies and GTI, demonstrating that government policies on talent cultivation and introduction support technological progress and specifically promote the development of environmentally friendly and green technologies.

Secondly, this paper extends research on the impact of macro-level incentive policies on micro-level corporate innovation behaviors. Existing literature has extensively explored the effects of financial, tax, and environmental policy incentives (Demirel and Kesidou 2011; Hu, Wang and Wang 2021; Yang et al. 2023; Wei, Wang and Xia 2024) on the decision-making of GTI enterprises and a few studies have analyzed the impact of talent policies on general innovation activities (Zhang, Liu and Yang 2021; Chen, Sun and Wang 2023; Zhang, Qu and Gao 2023). Unlike the studies above, our focus is on the impact of government talent policies on corporate GTI. This paper not only beneficially expands the research on the incentive effects of existing macro policies but also extends the application scope of the resource-based theory, delving into the nuanced ways talent policies influence organizational behavior.

The third significant contribution is the in-depth exploration of the intermediary mechanism of talent policy to promote corporate GTI. Based on confirming that talent policy directly impacts GTI, this study further analyzes how executive environmental attention as mediating variable affects the relationship between talent policy and GTI. The tests of this mediating mechanism reveal the specific path of talent policy affecting GTI and provide insights on how to strengthen the effect of talent policy through specific management measures and organizational strategies. For example, the concern of senior executives on environmental issues can lead enterprises to pay more attention to and invest in GTI activities. By analyzing the intermediary mechanism, this study not only improves the understanding of the mechanism of talent policy to promote GTI but also provides practical guidelines for government and enterprises further to promote enterprises' GTI activities and green transformation process.

Finally, the heterogeneity of pollution degree, ownership type of enterprises and industry is analyzed, thus revealing the industry and ownership sensitivity of the influence of talent policy on enterprises' GTI. Through in-depth exploration, this study finds that in heavily polluting and non-state-owned enterprises (non-SOEs), as well as in the power sector, the beneficial effect of talent policy on GTI is more pronounced. This finding provides critical insights into the differentiation of talent policy effects and theoretical basis and practical guidelines for formulating a more targeted talent policy that better satisfies the requirements of various enterprise categories and further promotes the development of enterprises' GTI.

The remainder of this paper is organized as follows. Section 2 elaborates on the main content and role of the government talent policy and proposes the research hypotheses. Section 3 introduces the research sample, variable measurement methods, and the research model employed. Section 4 presents the empirical results. Section 5 provides an in-depth discussion of the findings. Section 6 concludes the paper.

2. Theoretical analysis and research hypothesis

2.1 Talent policy

Talent policy refers to a series of strategic measures and policies formulated by the government to attract, train, utilize, and retain talents (Zhang et al. 2022; Zhang, Qu and Gao 2023). These policies aim to promote progress and growth in social, economic, scientific, and technological fields by creating an environment conducive to talent development and providing favorable conditions and opportunities. At the macro level, talent policy reflects a country or region's importance to human resources and development strategy. These policies may target the talent needs of specific industries, such as high technology, education, and healthcare, or they may be general policies for all fields. An enterprise-specific talent policy whose coverage focuses on the critical aspects needed to

promote the development of a business and enhance its competitiveness. In this context, the scope of coverage of the talent policy mainly includes the following aspects. (1) Support internal talent training and development programs, including professional skills training, leadership development programs, and employee career planning services, to improve the enterprise's overall talent quality and innovation capability. (2) Provide financial subsidies, tax breaks, or financial support measures to motivate companies to allocate resources toward research and development initiatives, especially those promoting product innovation, process improvement, and green technology development. (3) By providing preferential policies and incentives, such as visa facilitation, tax incentives, and housing support for senior talents, to attract high-end talents to join the enterprise and take measures to retain key talents, such as equity incentives and performance bonuses. (4) Promote cooperation between enterprises and universities and research institutions and support enterprises in participating in academic research, technology development, and talent training projects to accelerate the application and industrialization of new technologies. (5) Encourage enterprises to carry out personnel exchange programs with international partners, introduce advanced international technology and management experience, and support the overseas training and exchange of enterprise personnel to enhance the international competitiveness of enterprises. (6) Optimize the policy and legal environment of enterprise operation, reduce enterprises' employment and compliance costs, and provide a stable and predictable business environment for enterprises to attract and retain talent.

By focusing on these areas, the government's talent policy aims to provide all-round support for enterprises, assist businesses in securing competitive edges in the intense market rivalry, help enterprises gain advantages in the fierce market competition, and promote technological innovation, product upgrading, and business expansion through the power of talent. Such policies help enterprises grow and promote the development and progress of society and the economy.

2.2 The direct impact of talent policy on GTI

Based on the resource-based view, a company's competitive edge stems from its distinct resources and capabilities, including financial, physical, human, and knowledge resources (Wade and Hulland 2004; Clausen and Molden 2024). Talent policy directly increases an enterprise's essential resources by providing financial support and attracting high-quality talents (Chen, Sun and Wang 2023; Zhang, Qu and Gao 2023). This increase in resources enables enterprises to engage in a more significant number of green technology endeavors, improve the scope and depth of research and development, and thus enhance companies' competitive edge.

Specifically, the talent policy funding companies receive directly leads to an increase in the R&D budget, especially in green technology research and development. This budget increase is essential for companies to take on more innovative projects, especially those in green technologies with higher risks but greater potential returns. By reducing the financial burden on companies, these policies reduce the economic risk of R&D activities and incentivize companies to invest in long-term, challenging research projects. Zhang, Qu and Gao (2023) point out that firms can increase investment in innovation by implementing talent policy to stimulate compensation effects. More importantly, such financial support can expand the scope of research and development of enterprises, enabling them to explore new technological paths, including those that may have less impact on the environment or can improve resource efficiency. As a result, financial support increases R&D investment and enhances companies' ability and willingness to carry out GTI.

Secondly, talent policy plays a decisive role in improving the overall level and GTI ability of enterprises' R&D teams by attracting high-quality talents (Zhang, Liu and Yang 2021; Zhang, Qu and Gao 2023). With talent policy funding, enterprises can create attractive working and living environments, provide favorable treatment and development opportunities, and build a good innovation ecosystem to attract talent. These talents enter enterprises with the latest research results, advanced technologies, and innovative ways of thinking, greatly enriching enterprises' knowledge base and technology reserve (Sun et al. 2022). Their participation not only elevates the professional level of the R&D team but also introduces a new mode of thinking, providing a new perspective and method for enterprises to solve complex green technical problems. Zhang, Qu and Gao (2023) found that talent policy, indicative of an enterprise's legitimacy and caliber, can draw in exceptional talent and refine human capital composition through its distributive impact, thus providing impetus for enterprises' innovation activities. In addition, these high-quality talents can significantly improve the efficiency and output quality of the R&D process through efficient project management and team collaboration (Shi et al. 2022; Zhang and Liu 2022). Therefore, talent policies directly and profoundly impact improving the quality and efficiency of corporate innovation, thus accelerating the research development and application of green technologies.

Finally, high-quality talents can not only introduce the latest research results and advanced technologies into the enterprise but also promote the accumulation of knowledge through teamwork and knowledge sharing (Koo 2019; Zhao, Li and Yu 2021; Dong et al. 2023; Wang and Yu 2023), this accumulation of knowledge provides rich internal resources for companies to investigate and cultivate novel green technologies. At the same time, adding these talents also promotes an innovation culture within the company, encouraging all employees to participate in the innovation process and forming an environment of continuous learning and improvement. Therefore, we propose hypothesis 1.

> H1. Talent policy has a significant positive impact on corporate GTI.

2.3 Talent policy, executive environmental attention, and GTI

The upper-echelon theory emphasizes that an organization's critical decisions and strategic choices reflect its top managers' characteristics, experience, values, and knowledge (Boal and Hooijberg 2000; Chen et al. 2015). Therefore, when executives' environmental attention is elevated, they are more likely to recognize the importance of GTI and make it a core part of their corporate strategy.

Firstly, the government's talent policy support can improve the environmental attention of corporate executives. The talent subsidy policy can help enterprises draw and cultivate high-quality talent focusing on environmental protection and sustainable development. These talents usually have the

relevant professional knowledge and skills to effectively guide enterprises to implement environmental protection measures, such as energy efficiency improvement, waste reduction, pollution control, and implementing circular economy models. With the implementation of these environmental management measures, business executives will gradually realize that by reducing the negative impact on the environment, they can not only comply with legal and regulatory standards, avoid potential fines and lawsuits, but also enhance the brand image of the company and the goodwill of consumers, to gain economic benefits in the long run.

Secondly, talent policy makes environmental sustainability a core consideration in enterprises' strategic planning and decision-making process by improving the environmental attention of executives. As the decision-makers of an enterprise, executives' concern about environmental issues directly affects the allocation of enterprise resources, especially the orientation of R&D investment (Wu, Liang and Zhang 2020). When executives emphasize environmental sustainability, they are more likely to push companies to invest in GTI, seeking to reduce environmental negative impacts through technological advances. This shift in strategic focus has prompted companies to seek environmental efficiency improvements in existing products and services and explore new green technologies and business models to achieve long-term sustainability. In addition, such environmental attention by executives can also promote a company's sensitivity to changes in the external environment, enabling them to adapt more quickly to market and policy changes, such as increased consumer demand for green products or changes in environmental regulations.

Finally, the environmental attention of executives affects not only the internal strategic decision and resource allocation but also the external image and the relationship (Tang et al. 2018; Wu, Liang and Zhang 2020). When corporate executives publicly commit to and pay attention to environmental protection and sustainable development, it can significantly enhance the corporate image of social responsibility and the trust of consumers and investors. This positive external image helps companies stand out in a competitive market and attract more sustainability-conscious customers and partners. At the same time, an executive's focus on the environment fosters partnerships with government agencies, non-governmental organizations (NGOs), and other businesses, often vital to driving GTI and getting projects off the ground. For example, by participating in cross-industry GTI alliances or collaborating with research institutions on environmental projects, companies can share research and development costs and accelerate the market adoption and roll-out of new technologies. Therefore, executives' environmental attention provides a broader stage and more opportunities for GTI by enhancing companies' social credibility and expanding cooperation networks. Therefore, we propose hypothesis 2.

> H2. Talent policy can positively influence corporate GTI by improving executives' environmental attention.

Figure 1 presents the theoretical framework of this study, encompassing three key elements: GTI, government talent policy, and executive environmental attention. First, talent policy serves as a direct driver of GTI. Based on the resource-based view, it provides resource support and attracts high-quality talent, significantly enhancing a company's research and development capacity, particularly in the field of green technologies. Second, executive environmental attention acts as a mediating variable, playing a crucial role. When executives place greater emphasis on environmental issues, they integrate sustainability into the company's strategic planning, thereby driving increased investment in green technologies. Talent policy, by heightening executive environmental attention, further strengthens the company's commitment and implementation of GTI. Therefore, this theoretical framework reveals the comprehensive mechanism through which talent policy, by directly increasing enterprise resources and indirectly influencing executive environmental attention, promotes GTI, supporting hypotheses H1 and H2.

3. Research methodology

3.1 Sample

Considering that after 2010, the Chinese government increased its support for the green economy and sustainable development, and considering the availability and reliability of data, we selected Shanghai-Shenzhen A-share listed enterprises from 2010 to 2021 as the initial sample to study the influence of talent policy on corporate GTI. Green patent Data came from Chinese Research Data Services (CNRDS), and executive attention data came from the Wingo database. Talent policy, firm size, and other enterprise and financial data are from China Stock Market and Accounting Research (CSMAR). After obtaining the initial data, we eliminated the sample of financial and abnormal firms and the sample of missing key variables. After these steps, our sample consists of 30,286 firm annual observations. Since we use a Poisson regression model, which excludes firms with only one observation and firms with all zero results, 13,820 observations are left for the Poisson analysis (Yin and Li 2022; Zhai et al. 2022).

3.2 Variables

3.2.1 *Dependent variable*

Green Technology Innovation (GTI): GTI reduces environmental pollution, improves resource utilization, and supports the evolution of a green economy through new technologies and improved processes. Referring to existing research, we use the number of green patent applications as a proxy for the dependent variable (Yang et al. 2023). This indicator, being specific and easily quantifiable, can not only directly reflect the activity and ability of enterprises in GTI but also reflect the critical way enterprises' R&D investment and technological innovation achievements are displayed to the market and society. Moreover, worldwide, more and more policies and regulations are encouraging the development and application of green technologies. Green patents indicate a company's capacity to adjust to external environmental changes and fulfill market demands for eco-friendly products and technologies. Therefore, we employ the count of green patent applications to assess corporate GTI. We take patent data from CNRDS and then match the green patent data using the World Intellectual Property Organization's (WIPO's) Green Patent Inventory. To ensure the reliability of our results, we also measured GTI by considering the number of green invention patents and green utility patents. Since our dependent variable consists of non-negative integer count

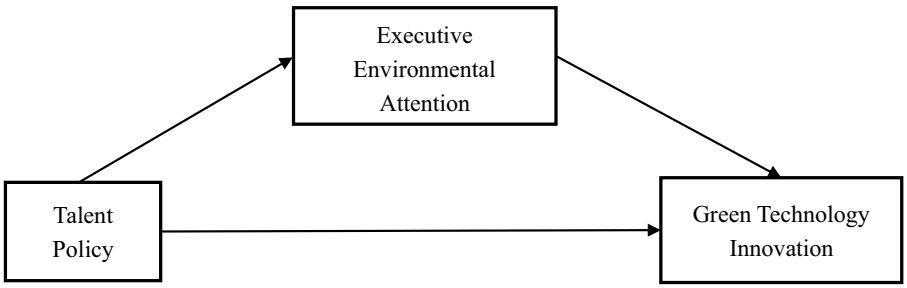

Figure 1. Theoretical framework.

data, we used the Poisson model for baseline analysis (Xiang et al. 2020; Yin and Li 2022; Zhai et al. 2022).

3.2.2 *Independent variable*

Talent policy (TP): The government subsidy details in the appendix of financial statements in the CSMAR database were searched by keywords. Select keywords 'talent' (*rencai*), 'thousand talents' (*qianren*), 'high-level personnel' (*wanren*), 'experts' (*zhuanjia*), 'excellent' (*yingcai*), 'thousands of enterprises and thousands of people' (*qianqiwanren*), 'talent recruitment' (*yincai*), 'postdoctoral' (*boshihou*), and 'yucai' (*talent education*). If the government subsidy details include the mentioned keywords, signifying that the company has secured government support through the talent policy, the talent policy is set to 1; Otherwise, it is set to 0. To ensure the robustness of our results, we also measured talent policy using the amount of talent subsidies.

3.2.3 *Mediating variable*

Our mediating variable is executive environmental attention (EEA). Corporate annual reports reflect the decision-making focus and priorities of the top management. Frequent mentions of eco-related topics in annual reports generally indicate that executives paid high attention to environmental issues during the past year. Concerning the research of Chen et al. (2015) and Liao et al. (2021), this paper takes the natural logarithm of the sum of the frequencies of keywords related to the ecological environment in the corporation's yearly report as the proxy variable of executives' environmental attention. Keywords related to ecological environment include environmental protection, emission reduction, energy saving, green, ecology, and pollution.

3.2.4 *Control variables*

Refer to previous studies (Bai et al. 2019, 2023; Huang, Liao and Li 2019; Xiang et al. 2020; Chen, Sun and Wang 2023), Our control variables include the size of the firm, the age of the business, financial leverage, research and development intensity, roa, and revenue growth rate, Fixed asset ratio, and asset-liability ratio. Table 1 gives the names and descriptions of all the variables.

3.3 Research model

The number of green patents is a classic example of count data, characterized by its rarity compared to the total number of patent applications. The Poisson model is well-suited for analyzing such count data, as it describes the frequency of rare events occurring within a fixed time or space (Xiang et al. 2020; Yin and Li 2022; Zhai et al. 2022). As a foundational model for count data, the Poisson model provides an initial estimate of the impact of talent policy on GTI. Despite the presence of a significant number of zero values in the data, the Poisson model effectively captures the fundamental influence of policy on firms' GTI output. Using the Poisson model as a baseline allows for a straightforward initial assessment of policy effects, providing a clear starting point for further analysis.

Moreover, the simplicity and interpretability of the Poisson model make it a valuable choice for the baseline model. The coefficients from a Poisson model directly indicate the effect of independent variables on the event rate, making the results easier to understand and communicate. This clarity is particularly beneficial in the early stages of policy analysis, helping policymakers and researchers grasp the practical implications of the policy.

Additionally, in subsequent robustness checks, we will compare the results of the Poisson model with those from the negative binomial regression model. Although the Poisson model may not fully address the issue of overdispersion in the data, consistency between the Poisson and negative binomial models in estimating policy effects will enhance the reliability of the research findings. Thus, the Poisson model provides a robust baseline for analyzing the influence of talent policy on GTI, ensuring that the conclusions drawn are both meaningful and reliable. Therefore, to test hypothesis H1, this paper establishes the Poisson model to analyze the influence of talent policy on GTI:

$$E\left(\mathrm{GTI}_{it}|\mathrm{controls}_{it},\eta_i,\tau_t\right) = \exp\left(\alpha_1\mathrm{TP}_{it}+\sum_{j=1}^{k}\alpha_{2j}\mathrm{controls}_{it,j}+\eta_i+\tau_t+\varepsilon_{it}\right) \quad (1)$$

Where GTI_{it} represents the number of green patent applications of the company i in year t, TP_{it} represents the talent policy of company i in year t, $\sum_{i=1}^{k}\beta_i\mathrm{controls}_{it}$ is the selected control variable, η_i represents the fixed effect of the company, τ_t indicates the year fixed effect and ε_{it} indicates the disturbance term.

To further analyze the mediating mechanism of the influence of talent policy on GTI, we refer to the stepwise test method (Baron and Kenny 1986; Wu et al. 2024). Therefore, in order to test hypotheses H2, this paper formulates the subsequent mediation effect models:

Table 1. Variable names and descriptions.

Variable type	Variable name	Symbol	Variable description
Dependent variable	Green technology innovation	GTI	Number of green patent applications
Independent variable	Talent policy	TP	If the enterprise obtains the talent policy subsidy, the talent policy is set to 1; Otherwise, it is set to 0.
Mediating variable	Executive environmental attention	EEA	The natural logarithm of the sum of word frequencies related to the ecological environment in the company's annual report
Controlled Variables	Firm size	Size	The logarithmic value of total assets
	Firm age	Age	The duration of years in existence of the business during the reporting period plus the natural logarithm of 1
	Financial leverage	FL	The ratio of change in earnings per common share to change in EBIT
	R&D intensity	RD	The ratio of net intangible assets to total assets
	Return on total assets	Roa	Net profit/total assets × 100%
	Revenue growth rate	RGR	Growth in business revenue as a percentage of total revenue in the previous year
	Fixed assets ratio	Fixed	Fixed assets as a percentage of total assets
	Asset-liability ratio	AssLia	Total liabilities as a percentage of total assets

$$\text{Mediator}_{it} = \beta_0 \ + \beta_1 \text{TP}_{it} + \sum_{j=1}^{k} \beta_{2j} \text{controls}_{it} + \eta_i + \tau_t + \varepsilon_{it} \tag{2}$$

$$E\left(\text{GTI}_{it} | \text{controls}_{it}, \text{Mediator}_{it}, \eta_i, \tau_t\right) = \exp\left(\gamma_1 \text{TP}_{it} + \gamma_2 \text{Mediator}_{it} \sum_{j=1}^{k} \gamma_{3j} \text{controls}_{it,j} + \eta_i + \tau_t + \varepsilon_{it}\right) \tag{3}$$

Model (2) verifies the influence of talent policy on intermediary variables. Mediator represents executive environmental attention variable, and $\beta 1$ represents the direct effect of talent policy on the Mediator variable. The linear regression model is more suitable since the mediating variable is continuous and does not count data. In addition, linear regression model provides a direct and easily interpretable way to assess the impact of talent policy on mediating variable. Therefore, we choose the linear regression model instead of the Poisson model to estimate the model (2). When the coefficient $\beta 1$ of model (2) is significant, the following intermediate effect test can be carried out. Model (3) verifies the final impact of talent policy and intermediary variable on GTI. The coefficient $\alpha 1$ of talent policy in the model (1) is compared with the $\gamma 1$ of the model (3). If $\gamma 1 < \alpha 1$, it suggests that the intermediate variable partially mediates the relationship between talent policy and GTI; if $\gamma 1$ is not significant, it indicates that the intermediary variable exerts a full mediating effect on the relationship between talent policy and GTI.

Using linear regression models for model (2) analysis is a reasonable choice based on data types and distributions. This does not negatively affect the results but is an appropriate methodological choice that ensures a more accurate estimate of the association among the variables in the model. The use of different models reflects the adaptation to the characteristics of different data distributions, which helps to improve the accuracy and explanatory power of the model estimates. Especially in mediation effect analysis, the correct model selection for the mediator and outcome variables is crucial to accurately evaluate the correlation among the variables. Therefore, the use of a linear regression model instead of the Poisson model in Model (2) is a reasonable choice based on the data type of the dependent variable (continuous variable), which helps to estimate the influence of talent policy on the intermediary variable more accurately, thus providing an accurate basis for analyzing the intermediary path of talent policy's influence on GTI.

Table 2. Descriptive statistics of variables.

Variable	Mean	Sd	Min	Max
GTI	1.743	14.067	0	933
TP	0.143	0.35	0	1
EEA	3.359	1.059	0.693	5.488
Scale	22.129	1.314	19.728	26.185
Age	2.86	0.364	0	4.158
FL	1.367	1	0.461	7.879
RD	0.044	0.049	0	0.323
Roa	0.053	0.042	0.001	0.212
RGR	0.22	0.458	−0.468	3.194
Fixed	0.205	0.157	0.001	0.689
AssLia	0.405	0.203	0.048	0.864

4. Research results

4.1 Descriptive statistics and correlation analysis

Table 2 reports descriptive statistics results for each variable. The mean level of the GTI in the sample is 1.743 (Sd = 14.067), indicating that the GTI has a wide range of data points and high variability. The average performance of the talent policy is 0.143 (Sd = 0.35), suggesting some variability between observations relative to the average. Table 3 gives the results of the correlation analysis. The correlations between all variables are within acceptable ranges. Table 4 shows the VIF tests for the significant variables. The VIF values for all variables are below 5, suggesting the absence of multicollinearity issues among them.

4.2 Baseline regression results

Table 5 reports the baseline regression results. As observed in column (1), the coefficient is 0.087 ($P < .01$), which means that the talent policy implemented by the government on the firm will significantly stimulate the firm GTI. When the talent policy score increases by 1 point, the average enterprise GTI will increase by $e^{0.087}$ points or ∼1.09 points. From columns (2) to (4), the incentive effect of talent policy on GTI is significant regardless of whether the fixed effect is controlled for the company and the year. Thus, hypothesis 1 of this paper is confirmed.

Table 3. Correlation coefficients of variables.

	1	2	3	4	5	6	7	8	9	10	11
GTI	1										
TP	0.031***	1									
EEA	0.247***	0.081***	1								
Scale	0.251***	−0.023***	0.24***	1							
Age	0.008	−0.018***	0.189***	0.195***	1						
FL	0.02***	−0.015***	0.012**	0.15***	0.063***	1					
RD	0.002	−0.017***	0.073***	0.048***	0.008	0.044***	1				
Roa	−0.016***	0.007	−0.005	−0.152***	−0.102***	−0.361***	−0.043***	1			
RGR	−0.015***	−0.003	−0.0007	0.016***	−0.033***	−0.062***	0.0006	0.13***	1		
Fixed	0.044***	−0.019***	0.106***	0.119***	0.022***	0.213***	0.11***	−0.093***	−0.063***	1	
AssLia	0.116***	−0.049***	0.038***	0.526***	0.183***	0.386***	0.016***	−0.390***	0.073***	0.091***	1

Note. ** and *** indicate statistical significance at the 5% and 1% levels, respectively. In order to reveal the potential linear relationship between variables and reduce the impact of extreme values on correlation analysis, logarithmic numbers of green patents are taken during correlation analysis.

Table 4. VIF test of major variables.

Variable	VIF
TP	1.01
EEA	1.12
Scale	1.52
Age	1.08
FL	1.31
RD	1.02
Roa	1.3
RGR	1.05
Fixed	1.08
AssLia	1.81
Mean VIF	1.23

Table 5. Results of baseline regression.

	GTI			
Variable	(1)	(2)	(3)	(4)
TP	0.087***	0.083***	0.094***	0.092***
	(0.017)	(0.017)	(0.017)	(0.017)
Control var	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	No
Year FE	Yes	No	Yes	No
Log likelihood	−27,330.72	−29,197.885	−36,730.91	−38,678.796
Wald Chi^2	12,479.32	8,613.16	12,823.60	8,822.63
Observations	14,400	14,400	31,356	31,356
Number of ID	1,745	1,745	4,461	4,461

Note. Standard errors are in parentheses. *** indicates statistical significance at the 1% levels.

4.3 Robustness test

4.3.1 *Substitute the independent variable*

Given that talent policy may be more than binary (with or without subsidies), the specific number of subsidies may have a different impact on a firm's GTI. Therefore, we re-measure the talent policy (TP1) using the logarithm of the amount of the government's talent subsidy to firms, which quantifies the actual size of the subsidy, not just the presence or absence of the subsidy. In column (1) of Table 6, the talent policy still significantly impacts GTI after replacing the independent variable.

4.3.2 *Substitutes the dependent variable*

The measurement index of GTI is replaced from the total number of green patent applications to only the number of green invention patent applications (GTI1) and the number of green utility patent applications (GTI2). The former focuses on evaluating the influence of talent policy on high-level innovation activities. In contrast, the latter focuses on promoting talent policy on technological improvement and practical innovation. In columns (2) and (3) of Table 6, the talent policy exerts a notable positive influence on both GTI1 and GTI2, which indicates that the talent policy is effective not only in promoting enterprises to engage in high-level innovation endeavors but also in encouraging them to pursue technological improvement and practical innovation. In other words, after replacing the dependent variable, H1 is still valid.

4.3.3 *Substitute regression model*

We introduced the Negative Binomial Model as an alternative to the panel Poisson model. The primary reason for introducing this model was the presence of a number of zero observations in the sample, which the Poisson model might not adequately capture. Specifically, in the data on firms' green technology innovation (GTI), many firms did not receive green patents in certain years, resulting in zero-value observations. This situation could potentially bias the estimation results of the Poisson model. Therefore, we opted for the Negative Binomial Model, which is better suited for handling mixed data with both zeros and positive values, to ensure the robustness of the results.

In Column (4) of Table 6, we re-estimated the impact of talent policies on GTI using the Negative Binomial Model. Even under this alternative model, the positive effect of talent policies on GTI remained significant (coefficient = 0.02, $P < .05$). This finding indicates that the positive effect of talent policies on green technology innovation is robust, even when considering the large number of zero observations in the sample.

By comparing the results of the Poisson model and the Negative Binomial Model, we can see that the positive effect of talent policies on GTI is not dependent on a specific model assumption but has broad applicability. This robustness check enhances the reliability of our research findings and further demonstrates that the policy's effect on green technology innovation is genuine, rather than a result of the statistical model chosen.

In summary, the introduction of the Negative Binomial Model not only better addresses the issue of zero observations in the sample but also strengthens the validation of the talent policy's effect, making the research conclusions more reliable. Policymakers and researchers can build on these

Table 6. Robustness test.

Variable	GTI (1) Replace the core independent variable	GTI1 (2) Replace the dependent variable	GTI2 (3) Replace the dependent variable	GTI (4) Replace the model
TP		0.054**	0.143***	0.105***
		(0.024)	(0.026)	(0.038)
TP1	0.007***			
	(0.001)			
Control var	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Log likelihood	−27,330.25	−17,355.944	−15,263.216	−16,049.436
Wald Chi^2	12,479.87	6,363.65	6,598.76	1,079.95
Observations	14,400	11,508	11,604	14,400
Number of ID	1,745	1,369	1,397	1,745

Note. Standard errors are in parentheses. ** and *** indicate statistical significance at the 5% and 1% levels, respectively.

Table 7. Results of the endogeneity test.

Variable	PSM GTI (1)	First stage TP (2)	Second stage GTI (3)	Lagged treatment GTI (4)
TP	0.114***		9.143***	
	(0.013)		(2.785)	
REI		0.012***		
		(0.003)		
L.TP				0.042**
				(0.019)
Control var	Yes	Yes	Yes	Yes
Firm FE	–	No	No	Yes
Year FE	–	Yes	Yes	Yes
Log likelihood	−123,500.36	–	–	−21,934.816
Wald Chi2	97,569.18	–	170.06	10,028.74
Observations	31,356	31,347	31,347	11,268
Number of ID	–	–	–	1,528

Note. Standard errors are in parentheses. ** and *** indicate statistical significance at the 5% and 1% levels, respectively.

robust findings to further explore and implement policies that promote green technology innovation.

4.4 Endogeneity test

4.4.1 *PSM*

We use propensity score matching (PSM) to perform the endogeneity test. First, we use the Logit model for propensity score estimation. To enhance the quality and accuracy of matching, reduce selection bias, and improve the reliability of causal inference, covariates include business assets, ROE, and operating income in addition to the baseline model's control variables. Next, we perform the nearest neighbor matching and balance tests. After matching, the biases of most variables are reduced, and the biases of most control variables are within the acceptable range. Finally, the matched samples were re-regression; the outcomes are displayed in column (1) of Table 7. The coefficient of talent policy is 0.114 ($P < .01$), indicating that talent policy exerts a notable beneficial influence on enterprise GTI, which still supports the conclusion.

4.4.2 *Instrumental variables*

We choose the regional education level (natural logarithm) as the instrumental variable in studying the impact of talent policy on enterprise GTI. On the one hand, the education level of a region reflects the quality and quantity of human capital in the region, which directly impacts the talent resources that firms can attract and utilize. A higher regional education level may mean more well-educated talents are potential beneficiaries of talent policy. Therefore, there is a natural correlation between regional education levels and the probability of companies adopting talent policy. On the other hand, regional education level, as a macro indicator, can theoretically only indirectly affect a firm's GTI by influencing the region's availability and quality of talent. It is assumed that the regional education level does not directly affect the GTI capability of the firm except through the channels of talent policy, which satisfies the condition of exclusivity of the instrumental variable.

We employ the Logit model to assess the talent policy in the initial phase. Column (2) of Table 7 reveals the coefficient of regional education level is 0.012 ($P < .01$), indicating that as the regional education level increases, the probability of enterprises accepting the talent policy also rises. At this stage, the fitting probability of the enterprise accepting the talent policy is generated, and this probability reflects the predicted tendency of each enterprise to accept the policy. In the subsequent phase, we employ the panel Poisson model to evaluate the influence of the talent policy on GTI. From column (3) of Table 7, it is evident that the coefficient of talent policy prediction value is 9.143, P value $< .01$, indicating that talent policy has a significant favorable influence on GTI. Considering the potential endogenous problem, the talent policy promotes enterprises' GTI.

4.4.3 *lags independent variables*

To ensure the robustness of our results, we propose introducing lagged variables to verify the stability of the model and the reliability of the findings. Although the Generalized Method of Moments (GMM) is a commonly used approach to address endogeneity issues and control for potential endogeneity bias, we have opted not to use GMM in this study for the following reasons:

First, GMM typically requires assumptions about endogeneity and the selection of appropriate instrumental variables. In our research, the introduction of lagged variables as a tool for robustness checks already effectively controls for endogeneity issues. Lagged variables help capture the dynamic characteristics of policy effects, thereby mitigating the impact of endogeneity on the results. Since lagged variables do not involve the additional complexity of selecting instrumental

variables, this approach is more straightforward and easier to interpret.

Second, using GMM in panel data models can introduce additional complexity and computational challenges. For a fixed-effects Poisson model, the implementation of GMM requires careful consideration of model specification, the validity of instrumental variables, and assumptions related to over-identification. This can lead to increased model complexity and demand more computational resources. In contrast, introducing lagged variables for robustness checks is relatively simple and does not require additional steps for selecting and testing instrumental variables, allowing for a more efficient robustness test.

Finally, the use of lagged variables not only effectively addresses endogeneity concerns but also provides a clearer interpretation of policy effects while maintaining the model's original structure. Lagged variables capture the dynamic changes in policy effects without significantly altering the model's setup. This makes lagged variables a reasonable and effective choice for analyzing the impact of government talent policies on corporate green technology innovation.

We consider the one-phase lag effect of talent policy to reveal the persistence of policy effects and reduce potential endogenous bias. From column (4) of Table 7, the coefficient for the lag variable is recorded as 0.042 ($P < .05$), suggesting a positive correlation between the talent policy implemented in the last period and the GTI of the current period. This result supports H1, that is, the talent policy significantly positively enhances the GTI, and this impact not only exists in the current period of implementation of the policy but will continue for at least the next period.

4.5 The mediating role of environmental attention

Table 8 shows the mediating effect test results. As can be seen from column (1), the coefficient of talent policy is 0.087 ($P < .01$), indicating that talent policy exerts a significant positive effect on GTI. Column (2) shows a notable positive correlation between talent policy and executives' environmental attention, indicating that talent policy is conducive to improving executives' environmental attention. Column (3) is the result of regression, which incorporates talent policy, environmental attention, and GTI into the same model. We find the positive impact of talent policy on GTI (coefficient 0.085, $P < .001$) and the positive impact of executives' environmental attention on GTI (coefficient 0.048, $P < .01$). Compared with columns (1) and (3), the coefficient of talent policy is lower, which indicates that talent policy significantly promotes the executives' environmental attention and thus improves the GTI of enterprises. Therefore, H2 is supported.

Table 8. Results of the mediation effect test.

	GTI (1)	EEA (2)	GTI (3)
TP	0.087***	0.028**	0.085***
	(0.017)	(0.011)	(0.017)
EEA			0.048***
			(0.011)
Control var	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Log likelihood	−27,330.72	–	−27,321.158
Wald Chi^2	12,479.32	–	12,487.20
Observations	14,400	31,356	14,400
Number of ID	1,745	4,461	1,745

Note. Standard errors are in parentheses. ** and *** indicate statistical significance at the 5% and 1% levels, respectively.

4.6 Heterogeneity analysis

4.6.1 *Heterogeneity of pollution level*

When investigating the influence of talent policy on the GTI, it is essential to consider whether enterprises belong to high-polluting industries. The grouping test aims to explore whether there exist disparities in the influence of talent policy on GTI across various groups of firms with distinct pollution levels. We divide the sample enterprises into high-polluting enterprises and non-high-polluting enterprises. Columns (1) and (2) of Table 9 report a comparison of the effects of talent policy based on pollution levels. For heavily polluting enterprises, the coefficient of talent policy is 0.136 ($P < .01$), which means that in high-polluting enterprises, the implementation of talent policy is positively correlated with the enterprise GTI, and the impact is significant. For non-heavy polluting enterprises, the coefficient of talent policy is 0.073 ($P < .01$), which indicates that talent policy also positively impacts the GTI of these enterprises. However, its effect size is not as large as that of heavy-polluting enterprises. This may be because heavy polluters encounter tremendous pressure regarding environmental improvement and higher GTI demand and are more likely to benefit from attracting or retaining key talents who can promote the development and application of green technologies.

4.6.2 *Heterogeneity of corporate ownership*

To understand how firms respond to talent policy in different ownership contexts and to assess whether there are differences in the effectiveness of these policies in promoting GTI, we conducted a group test of the sample based on firm ownership. The talent policy coefficient for SOEs (Column 3) was 0.054 ($P < .1$) and 0.12 ($P < .01$) for non-SOEs (Column 4). The results show that only non-SOEs are significant at the 1% level, and the regression results of SOEs do not reach the 5% significance level. This means that non-SOEs respond more positively to the talent policy, and the talent policy has a more vital role in advancing GTI in these enterprises. This may be related to the differences between the two types of enterprises regarding their operating models, decision-making processes, and sensitivity to market changes. Non-SOEs may devote increased attention to and effectively utilize human resources to drive innovation and application of green technologies due to more flexible management and higher market drivers. On the contrary, SOEs may be subject to more institutional constraints and policy orientation, and their response to talent policy and impact on GTI may be limited.

4.6.3 *Heterogeneity of key industries*

In this study, we selected the manufacturing, power, and information technology sectors for heterogeneity analysis, based on the 2017 China National Economic Industry Classification. This selection was made for several reasons. First, these three industries are highly representative in driving GTI. Second, the policy environment and market competition in these industries are relatively complex, providing a diversified space for testing policy effects. Particularly under different corporate types and external conditions, firms' GTI performance may vary significantly. Finally, these industries

Table 9. Results of group test.

	GTI Grouping based on pollution level		GTI Grouping based on corporate ownership		GTI Grouping based on key industries		
	Heavy polluting enterprises	Non-heavy polluting enterprises	SOEs	Non-SOEs	Manufacturing	Supply of electricity and heat	Information technology services
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TP	0.136***	0.073***	0.054*	0.12***	0.107***	0.553***	0.428***
	(0.034)	(0.021)	(0.03)	(0.022)	(0.019)	(0.125)	(0.142)
Control var	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log likelihood	−8,421.7898	−18,491.73	−11,670.8	−15,444.42	−21,257.258	−1,226.417	−610.614
Wald Chi^2	2,150.26	10,845.29	7,690.17	5,063.58	10,319.65	547.85	251.68
Observations	5,268	9,132	5,680	8,720	11,126	515	615
Number of ID	595	1,150	575	1,170	1,362	56	72

Note. Standard errors are in parentheses. * and *** indicate statistical significance at the 10% and 1% levels, respectively.

comprise a large proportion of the dataset, accounting for 64.01%, 3.43%, and 7.58% of the sample, respectively, totaling over 75%. Therefore, focusing on these industries enhances the representativeness and explanatory power of the research findings.

The analysis results indicate that talent policy has a significant positive impact on GTI across all three key industries. Specifically, the coefficient of talent policy for the power industry is 0.553 ($P < .01$), for the information technology industry, it is 0.428 ($P < .01$), and for the manufacturing industry, it is 0.107 ($P < .01$). While the talent policy coefficients are positive and statistically significant in all three sectors, the power industry exhibits the most pronounced response to talent policy, demonstrating its leading role in driving GTI.

5. Discussion

We comprehensively examine how the Chinese government's talent policy, as a macro policy, affects GTI behavior at the micro firm level. With China as the research background, this study reveals how government talent policy can promote the development of GTI activities by influencing the incentive mechanism and strategic positioning of firms in China's specific policy environment. This emphasizes the central role of talent policy in guiding and stimulating enterprise GTI and demonstrates the connection and mechanism between macro talent policy and micro-enterprise GTI behavior. In particular, this study further deepens the understanding of the differences in the role of talent policy in different economic and social contexts by analyzing the responses of various types of enterprises (such as heavy-polluting industries versus non-heavy polluting industries, SOEs versus non-SOEs) to government talent policies. This provides essential strategic guidance for how the government can formulate and adjust talent policy to more effectively promote green transformation and technological upgrading of enterprises, especially in the industrial sector, and also provides valuable references for other countries in designing talent policy to promote GTI.

First, this study confirms the beneficial impact of talent policy on fostering GTI, highlighting the need for governments and enterprises to attract and retain critical talents and stimulate their innovation potential through effective talent policy in the context of growing global emphasis on environmental preservation and green development. This finding further enriches the literature in human resource management and GTI, highlighting the crucial role of talent policy in achieving the transition to a green economy. Compared to other studies, this conclusion is not isolated. For example, Song, Yu and Xu (2020) and Shah and Soomro (2022) propose in their studies that human resource management practices, including selection, training, and performance management, can promote environmental management and organizational green behavior. In addition, the research of Zhang, Chen and Tang (2024) also supports this finding, pointing out that green human resource management positively contributes to both green product and process innovation. Together, these findings highlight the central role of talent policy in driving companies to achieve sustainable development goals in a globalized and competitive market environment. Especially in GTI, effective talent management strategies can attract innovative talents and motivate employees to participate in green practices, thus driving companies' efforts in environmental protection and sustainable development goals.

Secondly, the research further elaborates on the specific mechanisms by which talent policy can positively affect enterprises' GTI through improving managers' environmental attention. This study deepens the view of Li et al. (2022) that green focus has a positive impact on firms' GTI. We deepen our understanding of how incentive policies can promote firm GTI by influencing individual and team behavior. On the one hand, talent subsidy can align the personal interests of employees and managers with the long-term green development goals of the company. Such interest binding motivates key talents to contribute to the enterprise's GTI and helps attract those interested and experienced in GTI to join the enterprise. On the other hand, improving managers' environmental attention is achieved through transmitting culture and values. Companies need to cultivate a culture that regards environmental protection as a core value, which increases managers' sensitivity and awareness of ecological issues and influences the entire organization to push all employees to pay more attention to GTI and sustainable development.

Third, the impact of talent policy on GTI has been significantly asymmetrical. The favorable effect of talent policy is particularly notable in heavily polluting firms and non-SOEs, as well as in the power sector. This finding suggests that policymakers should consider the characteristics of industries and enterprises when designing talent policy and adopt more precise and targeted measures to maximize policy effects and promote GTI in different enterprises.

6. Conclusion and future directions

6.1 Conclusion

This study examines the impact of talent policy support on corporate GTI using data from Shanghai-Shenzhen A-share listed companies between 2010 and 2021. It analyzes the mediating role of executive environmental attention and explores the heterogeneous effects across different pollution levels, ownership types, and industry sectors. The findings reveal that talent policy has a significant positive effect on GTI, with the impact being particularly pronounced in highly polluting firms, private enterprises, and the power industry.

In terms of theoretical contributions, this study expands the application of existing theories in several ways. First, it extends the resource-based view by demonstrating that policy support can serve as a critical resource for corporate innovation, particularly in the realm of green technologies. Second, it enriches the upper-echelon theory by revealing how external policies can enhance executives' environmental attention, which in turn influences corporate innovation decisions. Third, it deepens the innovation-driven theory by showing that talent policy not only directly fosters innovation by attracting high-quality talent but also indirectly promotes green innovation by raising executive environmental awareness. Furthermore, this research uncovers the heterogeneous effects of talent policy under different contexts, offering new perspectives for policy design by highlighting how policy impacts vary according to firm characteristics.

Based on these findings, this study offers several key insights for policymakers and corporate managers. For policymakers, it is essential to develop targeted policy support that takes into account industry characteristics and pollution levels. In particular, more R&D tax incentives and subsidies should be provided to highly polluting industries, private enterprises, and the power sector, as these areas exhibit the most pronounced positive impact of talent policy on GTI. Moreover, priority should be given to accelerating the approval and introduction of green technology-related patents. For corporate managers, leveraging talent policies to attract and retain innovative talent is crucial. By utilizing incentives such as compensation and promotions, companies can foster a culture of innovation and promote green technology development. Furthermore, embedding the principles of environmental sustainability into the corporate culture will not only enhance the company's capacity for green innovation but also contribute to its long-term sustainable growth.

6.2 Limitations and future research directions

Although this study provides important insights into the impact of firms' access to talent policy support on their GTI and explores the role of incentives in this process and heterogeneity among different types of firms, there are some research gaps and potential directions for future research. First, this study, which mainly focuses on Shanghai-Shenzhen A-share listed companies, may only partially cover some types of enterprises, especially SMEs and non-listed companies, which may have different challenges and opportunities in GTI. Second, while the impact of executive environmental attention on GTI is analyzed, there is limited in-depth exploration of how other incentive mechanisms and internal management practices affect GTI, such as organizational culture, employee engagement levels, and external partnerships. Finally, although the study focuses on talent policy, it is important to assess whether the observed effects are consistent across different contexts. Future research should explore how talent policies and their impact on GTI might vary in different geographical, economic, and institutional environments. This includes examining the effectiveness of these policies in different countries with diverse regulatory frameworks and market conditions, as well as in sectors with varying levels of innovation and environmental impact. By doing so, researchers can determine whether the positive outcomes associated with talent policies in this study can be replicated or adjusted in other settings, providing a more nuanced understanding of how these policies can be effectively designed and implemented to promote green technological innovation on a global scale.

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