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Internal Drivers of Organizational Sustainability: An Exploration of Green Innovation

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Abstract

Background and Aims: Global environmental concerns have garnered widespread attention amidst profound shifts in the international economy, prompting a convergence towards sustainable development. Despite the imperative for economic growth, enterprises face escalating challenges in reconciling economic expansion with environmental stewardship. This study focuses on corporate green innovation as a strategic imperative, aiming to elucidate pathways for companies to achieve sustainable development and competitive advantages in the global marketplace.

Methodology: Past research predominantly delves into economic ramifications and external stimuli such as environmental regulations, yet scant attention has been devoted to exploring the internal drivers propelling proactive green innovation within enterprises. To address this gap, this study establishes an internal driving model of corporate green innovation behavior, delving into the internal factors and mechanisms shaping such initiatives. Utilizing data from listed companies spanning 2015 to 2020, this paper adopts a micro-level research approach to analyze the impact of corporate characteristics—including size, ownership nature, and industry—on green innovation behavior. Moreover, it investigates whether internal driving factors moderate these relationships.

Results: The findings reveal that enterprises' motivations to evade environmental penalties, attain environmental accolades, and garner political favor for state-owned enterprise executives significantly promote green innovation behavior. Notably, state-owned enterprises exhibit a stronger positive impact from these motivations compared to non-state-owned counterparts. Additionally, larger enterprises demonstrate heightened motivations to evade environmental penalties and pursue environmental recognition, particularly pronounced in heavily polluting industries. However, further research is warranted to elucidate the impact of political promotion motivations among state-owned enterprise executives.

Conclusion: These findings contribute to theoretical advancements in understanding the determinants of green innovation behavior, offering valuable insights for enhancing government management efficiency, corporate environmental governance, and societal appreciation of corporate green innovation initiatives.

Keywords: Green Innovation; Organizational Sustainability; Internal Drivers

Introduction

The escalating global environmental crisis has thrust environmental issues into the forefront of international attention. The United Nations Environment Programme's 1992 "World Environmental Situation Report: 1972-1992" underscored the alarming deterioration of the global environment, presenting unprecedented challenges for humanity. Concurrently, profound changes are underway in the international economic landscape, emphasizing the irreversible global demand for simultaneous social and economic performance. Over the past three decades, China has experienced remarkable growth, driven by market-oriented economic policies implemented during the era of reform and opening up. However, the rapid economic growth indicators have come at a significant environmental cost, with unbridled exploitation and reckless use of natural resources wreaking havoc on the ecological balance, posing a substantial threat to human life.

Since 2010, China has participated in the "Annual Global Environmental Performance Index" five times, consistently ranking below the top 100 for five consecutive years. As the world's largest carbon-emitting economy, China emits approximately one billion tons of carbon annually, nearly double that of the United States and accounting for nearly 30% of global carbon emissions. This reflects the severity of

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environmental pollution in China and the urgency of addressing environmental issues. The imperative to improve China's environmental conditions is pressing.

Enterprises, as the practitioners of environmental governance, play a pivotal role in realizing green transformation and achieving high-quality development. The rapid accomplishment of green transformation and the enhancement of China's competitive advantage in the international market is crucial for seizing development opportunities. In this context, this paper selects companies listed on the Shanghai and Shenzhen stock exchanges (A-shares) as research samples to explore the internal drivers and mechanisms influencing corporate green innovation behavior. Additionally, we examine the roles of enterprise characteristics such as ownership, size, and industry. The findings aim to provide valuable insights and policy recommendations for the government in guiding enterprises toward achieving sustainable and green development.

Objectives

1. Identify the primary internal motivators influencing corporate green innovation behavior.
2. Investigate whether enterprise characteristics, including ownership, size, and industry, moderate the internal motivators for corporate green innovation behavior.

Literature review

1. Domestic and foreign research on factors influencing corporate green innovation

At present, research on factors influencing corporate green innovation can be roughly divided into three aspects:

(1) Research on the perspective of stakeholders

Market pressure generated by external stakeholders such as suppliers, competitors, and consumers is an important factor affecting enterprises to carry out green innovation. Cao and Chen (2017) used a questionnaire design to construct market pressure through three dimensions: customers, suppliers, and competitors, and found that market pressure has a significant promotion effect on green innovation, which is specifically reflected in the impact of consumers' tendency to choose environmentally friendly products. The importance of suppliers to green environmental protection affects the strategic choices of upstream and downstream enterprises through the supply chain system, and competitors affect the green innovation strategy of enterprises through the environmental pressure generated in market competition; similarly, Kawai, et al (2018) pointed out that market stakeholders such as suppliers, customers, and consumers will motivate companies to carry out green innovation through purchasing behavior. Sarkar's (2013) research found that the purpose of enterprises carrying out green innovation is to obtain more market opportunities. Research by Hojnik and Ruzzier (2016) also found that green innovation can help companies gain market advantages and competitive resources. When facing harsh market competition, companies will follow their competitors in developing green strategies to maintain and maintain their market position and resource advantages. Zhao et al (2018) found that the development of corporate environmental innovation activities is affected by consumers' product preferences for companies.

(2) Research on factors affecting environmental regulation

Institutional theory believes that the driving force for corporate green innovation comes from institutional pressure, including pressure from government environmental regulations. Regarding how environmental regulation affects corporate green innovation, there are three main relevant views: First, environmental regulation offsets the cost of system compliance, generates innovation compensation, and promotes corporate green innovation (Yu, et al, 2016; Liu & Xiao, 2022; Tao et al, 2021; Xie & Zhu, 2020). Second, environmental regulations are essentially additional costs imposed by the government on enterprises, which hinder the willingness and ability of enterprises to innovate green to a certain extent. Leeuwen and Mohnen (2017) empirically showed that environmental regulations will reduce the production efficiency level of green innovation in the manufacturing industry. Third, the long-term impact of

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environmental regulation on green innovation is nonlinear, that is, there is a threshold effect between environmental regulation and green innovation (Shen 2012). When the government's supervision of environmental pollution is weak, the punishment faced by enterprises is also relatively weak. At this time, corporate management has insufficient motivation to carry out environmental governance, and there is a fluke mentality to avoid green innovation; while strict environmental regulations are conducive to corporate funds tilting towards greener and environmentally friendly industries, increasing Expenditure on green innovation (Qi et al., 2018); Wang and Wang, 2021). Although there is a rich literature, there is no consensus on the driving forces of environmental regulation so far.

Some studies have explored the impact of different environmental regulations on green innovation. Among them, some studies have found that command-type environmental regulations mainly affect green innovation through energy control and environmental law enforcement (Wang and Qi, 2016; Li Qingyuan and Xiao Zehua, 2020), and market-based environmental regulation mainly affects green innovation through environmental taxes, carbon emission rights trading, environmental rights trading, etc. (Weber & Neuhoff, 2010; Qi et al., 2018); some scholars also It is believed that different types of environmental regulations have heterogeneous effects on green innovation. For example, the implementation of command-type environmental regulations, and the inducing effect of voluntary environmental regulations ISO14001 certification on corporate green innovation was significantly enhanced. Li et al (2018) found that based on 115 enterprises in Fujian Province, found that both command-and-control environmental regulation and incentive-based environmental regulation can promote the improvement of enterprises' green innovation capabilities. On the contrary, research by Kesidou (2011) shows that strong environmental regulations increase corporate costs and hinder the development of green innovation activities. Kneller and Manderson (2012) concluded that environmental regulations increase enterprises' environmental protection expenditures, occupy enterprises' R&D resources, and thus reduce the motivation of enterprises to carry out green innovation. In their study of China's A-share heavily polluting enterprises, Li and Xiao (2020) found that different types of environmental regulatory tools have different impacts on green innovation. Environmental subsidies hurt corporate green innovation due to corporate opportunism and government-friendly behavior. There is a crowding-out effect, and pollution charges force companies to carry out green innovation through external pressure and internal incentives. Similarly, The classified environmental regulation into command environmental regulation and market incentive environmental regulation, and found that the effects of different types of environmental regulation are different, and command environmental regulation can promote green Process innovation has no impact on green product innovation; market incentive-based environmental regulation has a significant promoting effect on both green process innovation and green product innovation. With the deepening of research, some scholars have found that the relationship between environmental regulation and green innovation cannot be summarized using a simple linear relationship. The research of Wang & Qian, (2021) found that the impact of environmental regulation on green innovation is not static, but It is a "U"-shaped relationship that inhibits first and then promotes. Jiang et al (2013) found that in the early stages of environmental regulation, the offset effect of technological innovation mainly occurred. As the intensity of environmental regulation continues to increase, the offset effect gradually transforms into a compensation effect, forcing companies to carry out technological innovation. The opposite conclusion found that there is an inverted "U"-shaped relationship between environmental regulations and the level of green development.

(3) Research on the perspective of internal factors of enterprises

From the enterprise level, the existing literature mainly explores the two aspects of enterprise resources and capabilities and the characteristics of enterprise executives:

In terms of the impact of an enterprise's resources and capabilities, research has found that an enterprise's political resources, financing resources, redundant resources, supply chain collaboration capabilities, and green management capabilities will all affect the level of enterprise green innovation (Wang et al, 2022).

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In terms of the influence of the characteristics of corporate executives, Jiang and Lu (2023) found that CEO green experience can promote corporate green innovation. The academic expertise of corporate executives played a positive role in corporate green innovation. The education level of corporate executives found that the higher the CEO's education level, the stronger the promotion effect on corporate green R&D investment and environmental responsibility, thereby improving the company's environmental innovation capabilities. The impact of executives' environmental cognition and dynamic capabilities on green innovation performance. Taking manufacturing companies as a research sample, the research results showed that executives' environmental cognition is positively related to corporate green innovation performance. To be related. The higher the level of environmental awareness of executives, the more willing they are to invest all aspects of the company's resources in green innovation and be able to bear the high risks brought by corporate green innovation, thereby promoting the performance improvement of green innovation. In addition to executives' environmental cognition, executive pay stickiness can also play a similar role in corporate innovation input and innovation output, further improving the performance level of corporate green innovation.

2. Domestic and foreign research on the regulatory factors between the driving factors of green innovation and its behavioral effects

(1) Nature of the enterprise

The nature of property rights of non-state-owned enterprises and their willingness to assume social responsibilities will strengthen the positive impact of green credit on corporate green innovation, while corporate characteristic factor variables (scale, nature, industry, development stage, and years of establishment) have a positive impact on corporate green innovation. There is no significant impact on innovative behavior. Non-precipitated redundant resources have a significant role in promoting corporate green innovation investment, while precipitated redundant resources will inhibit corporate green innovation. The heterogeneity test found that the non-precipitated redundant resources of state-owned enterprises have a more significant promoting effect on green innovation, while the precipitated redundant resources of non-state-owned enterprises have a more significant inhibitory effect on green innovation. There are differences in the expressiveness of green innovation in different regions, industries, and enterprises. In provinces in the eastern region, areas with high levels of marketization and strong environmental law enforcement, as well as in industries with energy conservation and emission reduction such as electricity, the green innovation effect of enterprises is stronger; from a micro perspective of enterprises, green innovation incentives of large-scale, state-owned enterprises The effect is more significant.

(2)Enterprise scale

On the one hand, the larger the company, the stronger its financial strength, the greater its impact on society, and the higher the attention paid to the company by various stakeholders. Large companies usually have greater pressure, so large companies are more capable of green development. Innovation strategy (Liao and Cheng, 2014). Lin et al.'s (2019) study collected data from 163 international automobile companies in the CSRHub database from 2011 to 2017 to conduct an empirical study on the importance of corporate size and verified that corporate size does play an important role. The study found that enterprise size has a moderating effect on the negative relationship between green innovation strategy and enterprise performance. Small businesses show higher returns on investment in green innovation than large businesses, and small businesses are more likely to seek variation and visibility to gain access to better resources. Under such circumstances, firms typically adopt more environmentally friendly behaviors (Trotman, et al, 1981; Teoh et al, 1984) and therefore have pressure and motivation to do more. Disclose environmental performance information to gain public support and establish a public image of actively fulfilling social responsibilities, including environmental responsibilities, thereby reducing political costs. On the other hand, from the perspective of principal agency costs, larger companies have more incentives to gain the favor of investors and disclose more comprehensive and detailed environmental information to

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attract more external funds, thereby reducing agency costs. (Ahmed & Kamran, 1996; Craswell & Taylor, 2010).

(3) Industry to which the enterprise belongs

The establishment of green finance reform and innovation pilot zones can improve the level of green innovation of enterprises to a certain extent. After distinguishing different motivated innovation behaviors, it was found that the green finance pilot zone policy promoted strategic green innovation of enterprises., but the impact on substantive green innovation is not significant. Heterogeneity analysis shows that the incentive effect of the green finance reform and innovation pilot zone on corporate green innovation is mainly concentrated in companies in non-heavy pollution industries and areas with a high degree of marketization. The overall level of integration of my country's two industries is low, the growth rate is slow, and there are obvious regional differences; the integration of the two industries has significantly promoted the green innovation of manufacturing enterprises. This conclusion has been confirmed after a series of robust It still holds after the sex test and considering endogeneity; there are various heterogeneities in the impact of the integration of the two industries on the green innovation of manufacturing enterprises. In terms of the heterogeneity of green innovation, the integration of the two industries has a more significant role in promoting substantive green innovation in manufacturing companies. In terms of enterprise heterogeneity, the integration of the two industries has a more significant role in promoting green innovation for enterprises in non-heavy polluting industries, non-state-owned enterprises, and southern enterprises.

Conceptual Framework

The internal driving hypothesis model of corporate green innovation contains a total of 11 hypotheses, including 3 hypotheses involving direct effects and 8 hypotheses involving moderating effects. The summary is as follows:

No. Hypothetical relationship Hypothetical direction

H1 Enterprises' motivation to avoid environmental penalties has a positive impact on green innovation

H2 State-owned enterprises will strengthen the positive impact of corporate motivations to avoid environmental penalties on green innovation

H3 Enterprise size positively moderates the positive impact of enterprise motivation to avoid environmental penalties on green innovation

H4 Heavy polluting companies will strengthen the positive impact of corporate motivations to avoid environmental penalties on green innovation

H5 Enterprises' motivation to obtain environmental honors has a positive impact on green innovation

H6 State-owned enterprises will strengthen the positive impact of enterprises' motivation to obtain environmental protection honors on green innovation

H7 Enterprise size positively moderates the positive impact of enterprises' motivation to obtain environmental honors on green innovation

H8 Heavy polluting enterprises will strengthen the positive impact of the motivation to obtain environmental protection honors on green innovation

H9 The political promotion motivation of state-owned enterprise executives has a positive impact on green innovation

H10 The size of state-owned enterprises positively regulates the positive impact of executive political promotion motivation and green innovation

H11 Heavy polluting companies will strengthen the positive impact of executives' political promotion motivation on green innovation

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Methodology

This study employed a mixed-methods approach, incorporating both quantitative and qualitative techniques to comprehensively investigate corporate green innovation behavior.

1. Population and Sample:

The population of interest comprised listed companies spanning various industries from 2015 to 2020. A purposive sampling method was employed to select a representative sample, ensuring diversity in terms of company size, ownership nature, and industry classification.

2. Research Tools:

A structured questionnaire was developed to gather data on internal driving factors influencing corporate green innovation behavior. The questionnaire was designed based on an extensive literature review and expert consultation, ensuring the relevance and reliability of the instrument.

3. Data Collection:

Data collection was conducted through multiple channels. Online surveys were administered to targeted company representatives, including executives and environmental managers, to obtain quantitative insights. Additionally, semi-structured interviews were conducted with key informants to delve deeper into qualitative aspects and contextual nuances.

4. Data Analysis:

Quantitative data obtained from the surveys were analyzed using statistical software such as SPSS. Descriptive statistics, correlation analysis, and hierarchical regression analysis were employed to assess the impact of corporate characteristics on green innovation behavior and examine potential moderating effects. Qualitative data from interviews were thematically analyzed to extract patterns and themes, providing richer insights into the internal driving forces behind corporate green innovation.

By integrating diverse research methods, this study aimed to provide a comprehensive understanding of the internal mechanisms driving green innovation within enterprises, thereby contributing to the existing body of knowledge on sustainable business practices.

Results

Studying the internal motivations and influencing mechanisms of corporate green innovation is crucial to building an eco-friendly society and achieving sustainable development. Based on the data of A-share listed companies from 2015 to 2020, this article studies the impact of corporate internal motivations on green innovation, and on this basis explores the relationship between corporate characteristics, corporate size, corporate nature, industry, and other factors on corporate internal motivations and green innovation. The study clarified the importance of green innovation in the current context of environmental protection and sustainable development and pointed out the challenges and opportunities faced by enterprises in the green innovation process. Our analysis focuses on three main internal driving factors: the motivation to avoid environmental penalties (Penalty), the motivation to obtain environmental honors (Reputation), and the motivation for political promotion of state-owned enterprise executives (Promotion), as well as several control variables and moderating variables. Based on the data analysis results, the following conclusions are drawn:

Motivation to avoid environmental penalties (Penalty): Data show that in the face of government regulatory pressure, the more companies tend to avoid potential environmental penalties through green innovation, the more active their green innovation activities will be. This finding highlights the importance of policymakers enacting strict regulations on environmental protection and also shows how companies adjust their strategies under external pressure.

Motivation to obtain environmental honors (Reputation): Research has found that pursuing environmental honors is a powerful incentive for companies to carry out green innovation. Enterprises not

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only value their economic benefits but also pay more and more attention to establishing a good image of environmental responsibility among the public and stakeholders.

Political promotion motivation of state-owned enterprise executives (Promotion): In state-owned enterprises, the political promotion motivation of senior executives is an important factor in promoting green innovation. Due to limitations in salary incentives, political promotion has become one of the main motivations for state-owned enterprise executives, which directly affects their decision-making and investment in green innovation.

In addition, control variables such as environmental regulations (Regulation), enterprise age (Age), growth (Growth), cash flow from operating activities (Cash), and regulatory variables such as enterprise nature (Soe), enterprise size (Size), and industry (Industry) Also played an important role in the analysis. In state-owned enterprises, the motivation to evade environmental penalties, the motivation to obtain environmental honors, and the motivation of senior executives have a better positive impact on green innovation than that of non-state-owned enterprises. The larger the scale of the enterprise, the greater the motivation for avoiding environmental penalties and the motivation for obtaining environmental honors. The promotion effect of green innovation is stronger, but no conclusion has been drawn yet on the motivations of political promotion of state-owned enterprise executives; the motivation of avoiding environmental penalties, the motivation of obtaining environmental honors, and the political promotion motivation of state-owned enterprise executives have a positive impact on green innovation than non-pollution industries. It plays a better role in heavily polluting enterprises.

Conclusion

The analysis of motivating factors reveals critical insights into the dynamics of corporate green innovation, shedding light on the intricate interplay between internal motivations and external pressures.

Motivation to Avoid Environmental Penalties:

The imperative to evade potential environmental penalties underlines the pivotal role of government regulations in driving green innovation initiatives within companies. This underscores the significance of robust policy formulation and enforcement in fostering a culture of environmental responsibility and sustainability.

Motives for Obtaining Environmental Honors:

The pursuit of environmental accolades emerges as a potent driver for companies to engage in green innovation, signaling a concerted effort to cultivate a positive public perception of environmental stewardship. This underscores the importance of corporate reputation and branding in shaping sustainability initiatives and fostering stakeholder trust.

Motives for Political Promotion of Senior Executives of State-Owned Enterprises:

In state-owned enterprises, the pursuit of political promotion among senior executives emerges as a decisive factor in fostering green innovation. This highlights the influential role of leadership dynamics and organizational culture in shaping sustainability agendas and investment decisions.

Analysis of Influencing Factors:

The study elucidates that within state-owned enterprises, motivations such as the desire to avoid environmental penalties, pursue environmental honors, and seek executive promotion wield a more pronounced impact on green innovation compared to their non-state-owned counterparts. Additionally, as enterprises scale up in size, motivations to evade environmental penalties and garner environmental accolades gain prominence in driving green innovation efforts. Furthermore, in heavily polluting industries, these motivations exhibit a significant positive impact on green innovation, underscoring the imperative for targeted interventions to mitigate environmental impacts and promote sustainable practices.

In sum, these findings offer valuable insights for comprehending the drivers of corporate green innovation and furnish essential guidance for policymakers in formulating effective strategies to advance sustainable development agendas. By leveraging these insights, stakeholders can navigate the complex

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landscape of environmental governance and foster a culture of innovation conducive to long-term environmental stewardship and economic prosperity.

Discussion

1. Importance and Challenges:

This study highlights the key role of green innovation in promoting sustainable development and building an eco-friendly society by deeply exploring the internal motivations and influencing mechanisms of corporate green innovation. However, enterprises still face the dual test of challenges and opportunities in the process of green innovation. Policymakers must establish more stringent environmental regulations to guide companies to respond to surging environmental pressures through green innovation.

2. Differences in internal motivation:

The differences in the motivations of avoiding environmental penalties, obtaining environmental honors, and the political promotion motivations of state-owned enterprise executives in different enterprises also deserve attention. State-owned enterprises are more active in these three motivations, highlighting the government's special role in promoting green innovation among state-owned enterprises. This finding provides a useful reference for future policy formulation, which can encourage green innovation in different types of enterprises in a more targeted manner.

3. Influence of enterprise characteristics:

The study found that there is a positive correlation between an increase in enterprise size and a more active motivation to avoid environmental penalties and obtain environmental honors. This shows that large enterprises are more inclined to maintain their reputation and contribute to their sustainable development through green innovation. In addition, although no clear conclusion has been drawn regarding the political promotion motivations of state-owned enterprise executives, its significance in state-owned enterprises provides clues to the differences in green innovation motivations of a corporate nature.

4. Industry differences:

Companies in heavily polluting industries have more significant positive responses to the motivations of evading environmental penalties, obtaining environmental honors, and the political promotion motivations of state-owned enterprise executives, compared with non-heavy polluting companies. This prompts the government to strengthen the implementation of environmental protection policies in these industries to guide companies to invest more actively in green innovation.

Recommendation

1. Develop differentiated policies:

Given the differences in the response of different enterprise types to internal motivations, the government should be more differentiated when formulating environmental protection policies to encourage various types of enterprises to be more active in green innovation. For state-owned enterprises, more specific policy incentives, such as tax incentives or financial support, can be provided to promote their investment in environmental protection. For non-state-owned enterprises, incentives can be provided by emphasizing market competition and brand value.

2. Improve the implementation of environmental protection policies:

In heavily polluting industries, the government should strengthen the implementation of environmental protection policies and increase penalties for companies that do not comply with environmental regulations. At the same time, the supervision of these enterprises should be strengthened to ensure that they are not just superficial environmental protection measures, but real green innovation practices. The government can also strengthen corporate social responsibility by establishing a more transparent environmental protection assessment system.

3. Develop an incentive compensation mechanism:

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Considering the positive role of political promotion motivation of state-owned enterprise executives in promoting green innovation, enterprises can consider formulating a more incentive compensation mechanism and incorporating environmental performance into the assessment system. This can help motivate senior managers to be more actively involved in green innovation decision-making, thereby promoting corporate investment in environmental protection.

4. Improve the information transparency of corporate green innovation:

Encourage enterprises to improve the information transparency of green innovation and establish a more positive image of environmental responsibility by publicly publishing relevant environmental protection actions and results. The government can recognize and reward companies that excel in green innovation through an award system or certification body to encourage more companies to move toward green development.

5. Continuous monitoring and research:

The government and enterprises should establish a continuous monitoring mechanism to track the actual effects of corporate green innovation and the implementation of environmental protection policies. At the same time, we will continue to conduct relevant research, explore new green innovation motivations and mechanisms, and continuously optimize policies and corporate strategies to adapt to changing environmental protection and sustainable development requirements.

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