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RESEARCH ARTICLE

Green Behavioral Subjective Initiative and Green Performance - The Moderating Role of Paradoxical Cognition

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ABSTRACT

Environmental pollution and the depletion of energy sources constitute an issue of great social concern. Corporate green practices provide a fundamental solution to this problem and take a pivotal step toward corporate green transformation, so enhancing the subjective initiative of corporate green behavior has become a hot topic in research of this field. This study examined how corporate green behavior promotes the enhancement of environmental, economic and operational performance in corporate green performance under the moderating effect of paradoxical cognition, and explores ways and means to enhance the consciousness and initiative of enterprises in implementing green behavior. Data were collected from logistics corporations, which are major resource consumers and carbon emitters, in 10 provinces (direct municipalities) in China, including Shanghai. An analysis of 525 questionnaires revealed that green behaviors have a significant positive impact on environmental performance (β=0.357), economic performance (β=0.436), and operational performance (β=0.396), and are even more significant under the moderating effect of paradoxical cognition (environmental performance t=4.970; economic performance t=4.521; and operational performance t=5.103).). Driven by the improvement of green performance and the paradoxical cognition of executives, passive green (logistics) behavior has transformed into active green (logistics) behavior, enhancing the efficiency and effectiveness of corporate green transformation, while providing reference and inspiration for green practices of logistics enterprises, governments, and environmental protection departments.

1. INTRODUCTION

Environmental pollution and energy depletion are the focus of social concerns. As the main body of social and economic activities, enterprises shoulder the responsibility of energy conservation, emission reduction, and environmental protection. Implementing green behavior is the fundamental solution to the environmental problems and an important measure for the greening transformation of enterprises. Logistics corporations are major resource consumers and carbon emitters.In-depth research on the driving factors of green behavior in logistics enterprises, actively exploring methods and approaches to enhance the green performance of logistics enterprises, and achieving the low-carbon and green transformation of the logistics industry has become an important topic of academic concern, which is of great significance for achieving the goals of energy conservation, emission reduction, and socio-economic green transformation. Previous research on green behavior has mostly focused on the manufacturing industry and the external influences of the enterprise(Hall, 2000; Ho, Lin, & Tsai, 2014; X. Zhang, Ma, Tian, & Xue, 2017), with some also involving internal driving factors such as employees' environmental awareness or strategic cognition ((Papagiannakis & Lioukas, 2012; Shah, 2011; Singh, Jain, & Sharma, 2015). To strengthen the spontaneity and effectiveness of green behaviors, this study focuses on discussing the promoting effect of green behavior on green performance and the enhancement of the subjective

initiative of corporate green behavior. It elaborates on how corporate green strategy decisions are influenced by performance improvement and executives' paradox cognition, and seeks ways and methods to improve the subjective initiative of corporate green behavior implementation, sustainability, and corporate green performance, in order to achieve the goal of low-cost and high-efficiency corporate green transformation.The transformation from passive green behavior that enterprises have to do to proactive green behavior that they want to do has improved the efficiency and effectiveness of implementing green logistics behavior, thereby promoting the process of green transformation of logistics enterprises.

2. LITERATURE REVIEW AND RESEARCH HYPOTHESES

2.1 Related concepts

2.1.1 Green behavioral subjective initiative

As for the connotation of green behavior, many scholars have provided corresponding explanations around the core contents of green environmental protection and energy conservation.For example, according to Yu Wei and Ni Huijun, corporate green behavior refers to a series of environmentally friendly behaviors and positive programs adopted by corporations to reduce the impacts and hazards of corporate activities on resources and the environment, and is a corresponding response to resource and environmental issues(Yu & Ni, 2010)which can be classified into corporate resource-saving behavior and corporate environmental protection behavior(He, Du, & Chen, 2013).From a macro perspective, green behaviors refer to positive actions taken by individuals, organizations, or societies related to environmental protection and sustainable development. The scope of such behavior includes, but is not limited to, environmental activities such as energy conservation, reducing waste emissions, and low-carbon travel.Subjective initiative emphasizes the importance of individual free will and self-determination, as well as the influence of intrinsic motivation on individual behavior and personal achievement. Compared to passively implementing green behaviors under external influences or pressures, individuals or organizations with subjective initiative in green behavior independently and voluntarily formulate green strategies and implement green behaviors.

2.1.2 Green performance

Green performance refers to the achievements and performance of an organization, enterprise or individual in terms of environmental protection, sustainable development and social responsibility.It measures the extent to which an entity manages, improves and contributes to environmental protection and sustainable development in its business activities. Understanding the rich connotation of green performance varies among scholars, with early scholars arguing that green performance refers to the benefits achieved by enterprises in saving energy and reducing waste and pollution(Zhu & Sarkis, 2004), but obtaining economic benefits is a prerequisite for all environmental protection activities operating through a market economy(W. Li & Wu, 2013), that is without the economic benefits to back it up, the environmental benefits of enterprises lose their sustainability. Therefore, economic and environmental indicators should be included in green performance indicators(Chang, 2017; Gu, Qu, Gan, & Shen, 2014). In addition, it has been argued that development performance (or operational performance) should also be included in the green performance paradigm, that is, the benefits of a green transition should include environmental performance, financial performance, and development performance(González-Benito & González-Benito, 2005; X. Li, Du, & Long, 2020; L. Liu, 2019; Wagner, 2015).To sum up, the green performance of enterprises should include three aspects, namely, environmental performance, economic performance and development performance, of which environmental performance refers to the benefits achieved by enterprises, organizations or individuals through the adoption of environmental protection measures, such as reducing energy consumption, reducing waste emissions and environmental pollution, and improving the utilization rate of resources, so as to realize environmental protection and sustainable development of the economy and society.Economic performance mainly refers to the green behaviors of enterprises, organizations or individuals through the sale of green products or the provision of green services, etc., to enhance the reputation of enterprises, customer loyalty and sales volume, thus helping enterprises to achieve profits or revenues. Development benefits (or operational performance) refers to the

corporate benefits brought by enterprises through the implementation of green strategies and environmental protection behaviors to improve the relationship with the government and other stakeholders, and to expand the enterprise's business channels(Ren, Sun, & Xing, 2021).Green performance emphasizes the goal of achieving environmentally friendly and sustainable development in economic activities, with companies focusing not only on increasing profits in traditional financial statements, but also on whether corporate activities have a positive impact on the environment, ecosystems and social development.Green performance is a more scientific and comprehensive measure of corporate performance from multiple aspects and dimensions, emphasizing the importance of synergistic development of triple performance, which is in line with the current goals of energy conservation, emission reduction, and sustainable development.

2.1.3. Paradoxical cognition

Paradox refers to situations where there are contradictions or irrationalities in logic or statements that may lead to confusion, perplexity, or challenge traditional ways of thinking, intuition, and common sense.Paradoxical cognition usually refers to the understanding and awareness of paradoxes. Why they exist and what important information they reveal.Paradoxical cognition refers to a thinking pattern or cognitive ability in which individuals are able to simultaneously accommodate and handle conflicting viewpoints or beliefs in their thoughts. This cognitive ability can help people break through the limitations of conventional thinking when facing complex and uncertain problems, and find new perspectives and better solutions from seemingly contradictory situations. For example, leaders may need to find a balance between pursuing stability and innovation, and paradoxical cognition can help them consider both needs simultaneously, making more comprehensive decisions(Lewis, 2000; Schad, Lewis, Raisch, & Smith, 2016;Smith & Lewis, 2011).

2.2 Green behavior and green performance

As the practice of integrated green behavior continues to grow, the question of whether there is a trade-off between green practices and business performance is a growing concern. Do companies that focus more on green practices attract more business and achieve better business performance? In response to this question, a large number of scholars have conducted sufficient early research and found that firms' green behaviors have a positive effect on their green performance(C. Bai & Sarkis, 2013; Darnall, Henriques, & Sadorsky, 2010). Currently, many studies have examined the factors influencing green performance from the perspectives of institutional theory and stakeholder theory.According to institutional theory, the improvement of firms' green performance is the result of mandatory institutions and measures imposed by the government on firms; therefore, firms will only improve their green performance if the government implements mandatory policies and penalties(Walley & Whitehead, 1994).The regulatory and normative institutional environment improves the environmentally friendly attitudes of firm managers, which in turn encourages firms to choose an environmentally oriented corporate strategy(Roxas & Coetzer, 2012). In addition, corporate and government legitimacy(Zelong Wei & Gu, 2015), public opinion pressure(Jia & Liu, 2014), and mandatory environmental laws and regulations(Y. Li & Ye, 2011)clearly help to promote green performance and motivate companies to fulfill their social responsibilities.This leads to the conclusion that research based on institutional theory has found that green performance is the environmental performance of firms as a result of green behaviors implemented under institutional coercive pressures.Stakeholder theory, on the other hand, suggests that firms adopt green strategies because green performance can help improve the relationship between firms and stakeholders such as governments, communities, and consumers, which in turn favors the improvement of firms' financial performance. Some scholars have found that green behavior can increase customer purchase intention, product sales, and profitability(Luo & Bhattacharya, 2006; Russo & Fouts, 1997). Stakeholders such as customers, management and shareholders have a significant influence on firms' green management, and firms' green management has a significant positive influence on firm performance(W. Li & Wu, 2013).As consumers become more environmentally aware of products and services, and as government regulations become more stringent, green behavior of enterprises has become the key to improving market competitiveness. Natural resource-based theory suggests that the key to gaining competitive advantage lies in a firm's ability to be environmentally friendly in its operations, and that the prerequisite for a firm to

achieve green performance is whether it has implemented green behaviors(Hart, 1995).In a study on the green performance of ports, Gu Lei et al.found that external green cooperation and internal green practices in ports not only positively contribute to the green performance of ports, but also positively enhance the competitiveness of ports(Gu et al., 2014). From this, it can be concluded that green performance can be regarded as a product of enterprises seeking competitive advantage.

2.2.1 Green behavior and environmental performance

Enterprises need to focus not only on economic performance, but also on social responsibility and environmental benefits. In order to encourage enterprises, as the main body of economic development, to pay more attention to environmental protection while pursuing economic performance, it is necessary to analyze the influencing factors and driving conditions of enterprise green performance. A large number of studies have shown that companies' green behaviors make a positive contribution to their environmental performance. For example, Clarkson et al. empirically analyzed the relationship between green behaviors and corporate performance of listed companies in five industries in the United States, and the results showed that the higher the degree of implementation of green behaviors in companies, the more significant the improvement in their economic and environmental performance(Clarkson, Li, Richardson, & Vasvari, 2008).

Reducing environmental pollution in the process of business activities such as material procurement, product design, goods delivery and recycling can significantly improve the environmental performance of enterprises(Gu et al., 2014; Vanalle, Ganga, Godinho Filho, & Lucato, 2017). Lai and Wong's empirical analysis proved that the implementation of green logistics management in operations, inbound and outbound logistics, marketing and service can help enterprises save resources and enhance economic and environmental benefits(Lai & Wong, 2012). Axix et al. emphasized that the willingness and availability to engage in green supply chain management is important for environmental sustainability and can help companies achieve harmonized economic and environmental performance(Aziz, Jaafar, & Tajuddin, 2016). Khan et al. argued that the use of renewable energy sources in logistics operations will improve environmental and economic performance, and greater environmental sustainability can improve human health and economic growth(Khan, Zhang, Kumar, Zavadskas, & Streimikiene, 2020). It also improves environmental performance by reducing the environmental cost of production through the implementation of green behaviors that reduce environmental pollution(Zhu, Sarkis, & Geng, 2005). Agyabeng-Mensah et al. examined the ability of green logistics management practices to achieve sustainable performance by examining the direct impact of green logistics management practices on environmental, social, market,and financial performance, and the results of the study showed that green logistics management practices have a significant positive contribution to environmental performance and improve financial performance through environmental and market performance(Agyabeng-Mensah, Afum, & Ahenkorah, 2020). Similarly, by analyzing the relationship between green behaviors and environmental performance of 10 logistics service providers, Colicchia et al.found that green initiatives of the firms positively impacted environmental performance(Colicchia, Marchet, Melacini, & Perotti, 2013). Li Aijun and Liang Changyong analyzed the performance of 178 companies that implemented green supply chain management, and the results showed that implementing green supply chain management has a positive promoting effect on the economic and environmental performance of the companies(A. Li & Liang, 2015). The proactive environmental protection strategies adopted by the companies can improve their environmental and financial competitiveness(Huang & Shih, 2010). Compared with economic performance and operational performance, green supply chain management has the most significant impact on corporate environmental performance(Fang & Zhang, 2017).Accordingly, this paper proposes the following hypotheses:

H1a: Green behavior has a significant positive effect on environmental performance;

2.2.2 Green behavior and economic performance

Some scholars study the role of green behaviors in promoting economic performance from the perspective of ecological modernization theory and stakeholder theory. According to ecological modernization theory, green innovation practices reduce the cost of raw materials and pollution control, and at the same time, green behaviors and environmentally friendly products (or services) meet the growing demand for green consumer awareness among customers, which improves the company's reputation, customer purchase intention, and product sales and profitability(Luo & Bhattacharya, 2006; Russo & Fouts, 1997), and thus gain more market share and sales revenue. That is, a company's green innovation practices can help the company gain both economic and environmental benefits，bringing benefits to the enterprise and improving its business performance(Murphy & Gouldson, 2020; G. Zhang & Zhang, 2013). Stakeholder theory, on the other hand, suggests that firms adopt green strategies because improved green performance helps to improve the relationship between firms and stakeholders such as governments, communities, and consumers, which in turn facilitates the improvement of firms' financial performance. The higher the level of implementation of green behaviors by firms, the more significant the improvement in their economic and environmental performance(Clarkson et al., 2008). In addition, the fulfillment of environmental social responsibility and corporate green innovation helps enterprises shape a good brand image, reputation and word-of-mouth, which enables them to gain a competitive advantage in market competition(Singh et al., 2015), which enhances the competitiveness of corporate marketing and thus increases the financial returns of enterprises(X. Bai & Chang, 2015), and the implementation of green supply chain management helps enterprises achieve a win-win situation in terms of economic and environmental benefits(Frondel, Horbach, & Rennings, 2008; Xie, Xie, & Yi, 2015; Ye & Zhang, 2010). At the same time, reducing environmental pollution and saving costs through waste recycling has improved the economic performance of the enterprise(Agyemang, Zhu, Adzanyo, Antarciuc, & Zhao, 2018; C. Bai & Sarkis, 2013; Isaksson & Huge-Brodin, 2013). Therefore, corporate green management has a positive impact on the economic performance of companies(Foo, Lee, Tan, & Ooi, 2018).

In summary, green behavior brings both environmental and economic benefits to enterprises, and good environmental performance can help enterprises reduce the consumption of raw materials, energy and labor, reduce the cost of environmental governance and penalties for violations of law, which is more conducive to improving the economic benefits of the enterprise(Jacobs, Singhal, & Subramanian, 2010; Zelong Wei, Shen, Zhou, & Li, 2017).Accordingly, this paper proposes the following hypotheses:

H1b: Green behavior has a significant positive impact on economic performance.

2.2.3 Green behavior and operational performance

Green behaviors or green innovation practices not only positively and beneficially affect the environmental performance and economic performance in green performance, but also promote the operational (development) performance. For example, Zhu Qinghua and Geng Yong verified through empirical analysis that the green supply chain management practices of enterprises have a certain impact on all three types of performance(Zhu & Geng, 2006)or different degrees of impact(X. Chen & Xiu, 2013) from the three dimensions of economic, environment a land operational performance. Liu Bin and Zhu Qinghua verified the green supply chain practice factor and enterprise performance factor from the four dimensions of positive and negative financial performance, economic performance and operational performance of manufacturing enterprises, and the analysis results showed that the practice activities of green supply chain management have a positive promoting effect on enterprise performance(B. Liu & Zhu, 2009)and are an effective means to improve enterprise performance(Wang & Luo, 2010).On the other hand, Mou Fangzhou studied the impact of green supply chain management implementation on corporate performance in China's automobile manufacturing industry from the dimensions of environmental, economic and operational performance, and the results of the study showed that the implementation of green supply chain management had a positive impact on all three dimensions of corporate performance(Mou, 2016). A quantitative study conducted by Chen-Cheng Fang and Jian-Tong Zhang on the empirical research literature on the relationship between green supply chain management and firm performance found that green supply chain management has the most pronounced effect on firm environmental performance, followed by economic performance and operational

performance(Fang & Zhang, 2017). Green supply chain management positively affects corporate performance and production efficiency, and has a positive and indirect impact on corporate performance through environmental and operational performance(Abdallah & Al-Ghwayeen, 2020). From the perspective of logistics firms, operational performance refers to the improvement of firms' customer responsiveness, service delivery, and distribution efficiency, and the implementation of green behaviors by logistics firms is conducive to the promotion of environmental

performance(Colicchia et al., 2013), economic performance, and operational performance(C. Bai & Sarkis, 2013; Min & Ko, 2008).Based on the literature review above, it is concluded that the implementation of green supply chain management has a positive promoting effect on the environmental, economic and operational performance of enterprises to varying degrees. Based on this, this article proposes the following hypotheses:

H1c: Green behavior has a significant positive effect on operational (or developmental) performance.

2.3 The moderating role of paradoxical cognition

Previous research on the factors influencing green performance has mainly focused on drivers such as external pressures from institutions or stakeholders —arguing that firms improve green performance because they are forced to adopt green behaviors due to institutional and penalty cost pressures, or that firms rationally adopt decisions to improve green performance in order to improve stakeholder relations. It can be seen that previous studies have overlooked the role of factors within firms in driving green performance. Researchers also need to consider whether managers are influenced by cognitive tendencies when making green strategy decisions.In recent years, studies exploring the factors influencing green performance from a cognitive perspective have attracted increasing attention from scholars. According to the theory of strategic cognition, under the role of limited rationality or irrational factors, the decision-making of enterprises is also influenced by cognitive tendencies(Zesheng Wei, Yang, & Wei, 2018). For example, Peng et al. found that the strategic cognitive tendency of "unity of heaven and mankind" can significantly improve the green performance of enterprises(Peng, Li, & Tian, 2016), and Tang et al. found that the arrogant attitude of CEOs inhibits enterprises from assuming social responsibility(Tang, Qian, Chen, & Shen, 2015).Although strategic cognition theory complements institutional and stakeholder theories and provides new perspectives on the factors influencing environmental performance, it still fails to analyze in depth the impact of cognitive conflicts caused by the performance paradox on green policy making. Therefore, some scholars have applied the concept of "paradoxical cognition" to the study of factors influencing green performance. Paradoxical cognition research points out that the relationship between green performance and financial performance is not an either/or conflict or a single mutually reinforcing relationship, but rather a paradoxical relationship that is both conflicting and complementary(Smith & Lewis, 2011).Therefore, the willingness of firms to invest more resources in improving green performance depends on how firms understand and view the paradoxical relationship between green performance and financial performance. Enterprises that believe that an increase in green performance implies a decrease in financial performance invest less in green behaviors, while enterprises that believe that an improvement in green performance leads to an increase in financial performance invest more in green behaviors.

Enterprises with a low level of paradox awareness usually only see the short-term, explicit negative impacts of green performance and ignore the long-term, implicit corporate benefits it brings, and thus tend to make an either/or choice between green performance and financial performance, whereas enterprises with a high level of paradox awareness are able to recognize the long-term, implicit indirect benefits of greening, as well as the positive impacts on financial performance, an dare able to identify strategies and opportunities to balance green performance and corporate performance thereby promoting the willingness of enterprises to invest resources to improve green performance(Zesheng Wei et al., 2018).

It can be seen that how enterprises view the relationship between green performance and financial performance determines whether they adopt green behaviors, which in turn is an important way for firms to improve green performance. Paradoxical cognition profoundly affects the response

strategies of enterprises to performance paradoxes(Smith & Lewis, 2011)and can also prevent enterprises from focusing only on financial performance and neglecting green performance improvement(Hahn, Preuss, Pinkse, & Figge, 2014).Based on the fact that green performance consists of three dimensions: environmental, economic and developmental performance, this paper proposes the following hypotheses:

H2a: Paradoxical cognition has a positive moderating effect on the transformation of green behavior into environmental performance;

H2b: Paradoxical cognition has a positive moderating effect on the transformation of green behavior into economic performance;

H2c: Paradoxical cognition has a positive moderating effect on the transformation of green behavior into.

3. MODEL FRAMEWORK

Based on the hypotheses, a model framework was constructed to examine the moderating effects of paradoxical cognition on the effects of green behavior on green performance (Figure 1).

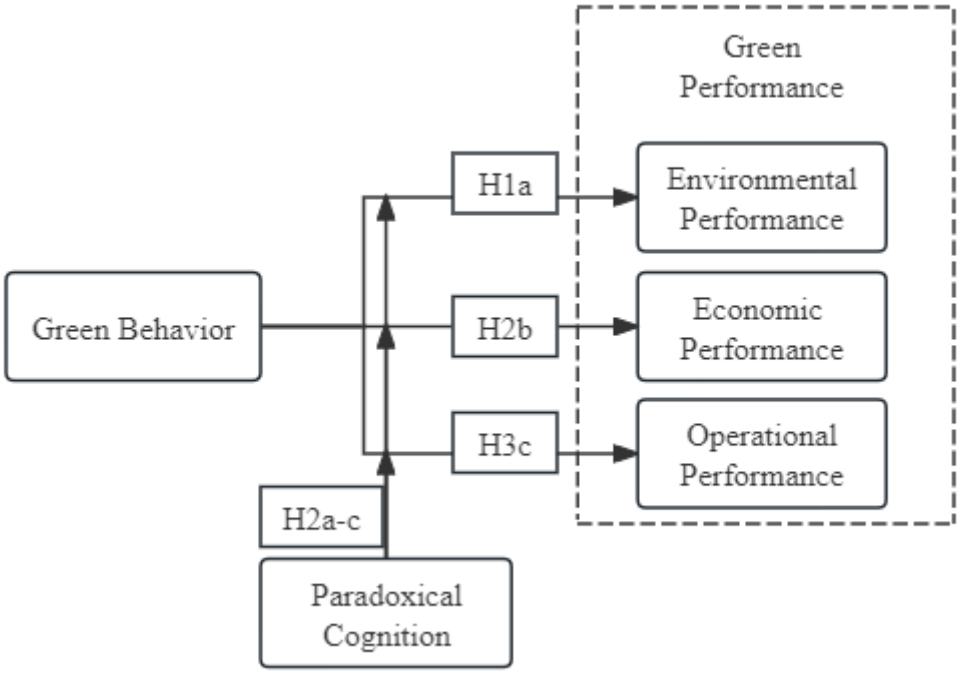

Figure 1: Research model of the driving effects of green behavior on green performance

4. Study design

4.1 Measurement of variables

The green behavior scale was primarily based on previous studies(Y.-S. Chen, 2008; Y.-S. Chen, Lai, & Wen, 2006; Chiou, Chan, Lettice, & Chung, 2011), and was tailored to fit the nature and characteristics of the subjects of this study, encompassing eight items across three dimensions—environmental materials and technologies, green transportation and storage, and green operations management. Environmental Performance was measured using the methods detailed in references(Ferguson, 2011; Zelong Wei & Gu, 2015; Zhu & Sarkis, 2004). Economic Performance was measured using the method developed by Bai & Sarkis(C. Bai & Sarkis, 2013); The scale for measuring operational performance drew on questionnaires used in previous studies(B. Zhang, Yang, Meng, & Lin, 2022).The paradoxical cognition scale is mainly based on paradoxical cognition research conducted by Smith and Lewis(Smith & Lewis, 2011) and Wei et al. (Zesheng Wei et al., 2018), and includes 2 dimensions and 5 items on strategic decision cognition and firm performance cognition.Incorporating feedback from experts, scholars, and corporate executives,all items were

carefully scrutinized, modified, and integrated,and some items were further revised before a preliminary questionnaire was ready.

To ensure that the questionnaire has good level of construct validity and content validity, prior to conducting the formal research, a small-scale pre-survey was conducted for the logistics enterprises in Jinbang Logistics Park, Taihe Town, Baiyun District, Guangzhou City, in order to preliminarily test the reliability and validity of the scale.According to the research results, the items or logical framework of the questionnaire were again modified, and if necessary, unreliable indexes were eliminated or modified, which resulted in the final scale of this study.All items in the scale are measured using the Likert Scale, with numbers 1, 2, 3, 4, 5, 6, and 7 representing "strongly disagree", "disagree", "somewhat disagree", "neutral", "somewhat agree", "agree", and "strongly agree", respectively.

4.2 Sample and data

Sample and data of this study was collected from a questionnaire survey conducted with logistics corporations across a wide geographic area in nine provinces—Guangdong, Zhejiang, Jiangsu, Shandong, Shaanxi, Henan, Hubei, Sichuan, and Yunnan—and Shanghai. A total of 600 questionnaires were distributed, of which 566 were returned, resulting in 525 valid questionnaires and a validity rate of 93%.The participants were mainly managers of logistics enterprises, of which middle management had the highest percentage, accounting for 54.86% of the total number of the participants,followed by managers with 16.95%. The proportions of chairmen, general managers and junior managers were relatively low at 7.43%, 6.48% and 14.29% respectively.The number of managers with bachelor's degree is the largest,accounting for 59.24%, followed by 23.81percent of master's degree holders, 7.43percent of doctoral degree holders and 9.52percent of specialists. Therefore, the data sources, which are characterized by a wide geographical coverage and a concentrated volume of logistics operations, make the results of the study more representative.Therefore,the data sources of wide geographical coverage and concentrated logistics business volume made the research results more representative.

4.3 Ethics and consent statement

This research was conducted under the approval certificate issued by the Institutional Review Board (IRB) of Krirk University's International College (approval number 2024E1507).Prior to conducting the research, verbal informed consent for participation was obtained from the participants.

5. Empirical analysis

5.1 Reliability and validity tests

Cronbach's alpha coefficient method was used for the reliability analysis of the questionnaire in this study.SPSS 27 was used to perform the reliability analysis of the latent variables of the questionnaire data (green behavior, paradoxical cognition, environmental performance, economic performance, and operational performance).The alpha values of the five latent variables were obtained as 0.928, 0.890, 0.862, 0.853and 0.863respectively (see Table 1).All the reliability coefficients are all greater than 0.8, indicating that the research data are of high quality in terms of reliability and can be used for further analysis.

Table 1: Sample reliability

Variable	Items	Cronbach Alpha coefficient
green behavior	8	0.928
environmental performance	4	0.862
economic performance	4	0.853
operational performance	4	0.863
paradoxical cognition	5	0.890

Validity analysis was measured using KMO and Bartlett's test.The KMO value was 0.918 (greater than 0.8; the interval of 0.5-0.9 indicates a range from highly unsuitable to highly suitable) (Table 2), which indicates that the research data are well suited for information extraction and meet the prerequisites off actor analysis.The p-value of Bartlett's test of sphericity was 0 (p<0.05)(Table 2), which indicates that the research data are suitable for factor analysis, so the validity test of the questionnaire passed.

Table 2: **Data validation**

KMO value	Approximate chi-square	0.918 5829.850
Bartlett's sphericity test	df	190
	p	0.000

5.2 Structural equation modeling

In this study, structural equation modeling SEM was used to verify the research hypothesis. The SEM model is a multivariate data analysis method that can be used to study the relationship between multiple explicit indicators and latent variables, and to test the fitness level between data and theoretical frameworks(Wu, 2009).The relationship model (Figure 2) of this study was subjected to structural equation testing using Amos28,and the test results are shown in Table 3.

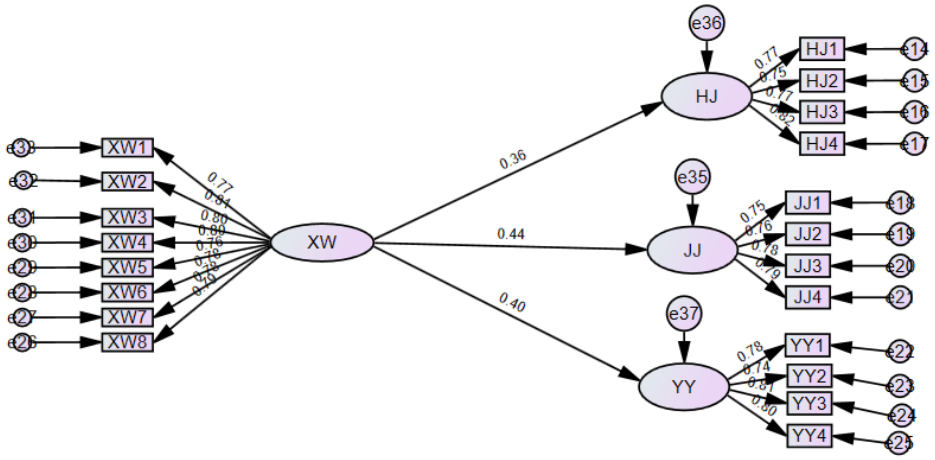

Figure 2: **Standardized path coefficients of the structural equation model.XW, Green Behavior; HJ, Environmental Performance; JJ, Economic Performance; YY, operational performance**

Table 3: Fitness of the structural equation model

Fit indicator	**CMIN/DF**	**RMSEA**	**GFI**	**AGFI**	**NFI**	**IFI**	**TLI**	**CFI**
Standard of fit	＜3-5	＜0.08	>0.85	>0.9	>0.9	>0.9	>0.9	>0.9
Test result	1.726	.037	.948	.935	.951	.979	.976	.979
Judgement	Matched	Matched	Matched	Matched	Matched	Matched	Matched	Matched

From the fitting results of the structural equation model (Table **3)**, it can be seen that the CMIN/DF value is 1.726, which meets the fitting standard of<3-5, and the RMSEA value is 0.037, which is less than the critical value of 0.08. The statistical test quantities GFI, AGFI, NFI, TLI, IFI, CFI, etc. all meet the fitting standard of 0.9 or above, indicating that this structural model has good fitting with the sample data and ideal intrinsic quality, and can be used for further hypothesis verification.

Table 4: Path Coefficients of the structural equation model

Structural equation model path	Unstandardized path coefficient	S.E.	C.R.	P	Standardized path coefficient
HJ <--- XW	.350	.048	7.252	***	.357
JJ <--- XW	.421	.049	8.666	***	.436
YY<---XW	.393	.049	8.025	***	.396

As suggested by the path coefficients of the structural equation model (Table 4), it can be seen that XW (green behavior) has a significant positive effect on HJ (environmental performance) (standard path coefficient is 0.357, p-value is less than 0. 001), thus supporting that hypothesis H1a is valid; XW (green behavior) has a significant positive effect on JJ (economic performance) (standard path coefficient is 0.436, p-value is less than 0.001), thus supporting that hypothesis H1b holds true; XW (green behavior) has a significant positive effect on YY (operational performance) (standard path coefficient is 0.396, p-value is less than 0.001), thus supporting that hypothesis H1c is valid.

5.3 Analysis of moderating effects

Moderating effects of this study were analyzed using SPSS 27 with a two-step process:1) Centralize the independent variable (green behavior) and the moderating variable (paradoxical cognition) (the dependent variable (environmental performance, economic performance, and operational performance) is not treated); 2) Dividing the moderating effect into three models: Model 1 includes only the independent variable (green behavior); Model 2 was developed from Model 1 by adding the moderating variable (paradoxical cognition); and Model 3 is formed by adding interaction terms (the product term of the independent variable and the moderating variable) to Model 2.The moderating effect can be examined in two ways: first, to examine the significance of the change in the F value from Model 2 to Model 3, and second, to examine the significance of the interaction term in Model 3. The results of testing the moderating effect of paradoxical cognition on green behavior and environmental performance, economic performance and operational performance are shown in Table 5, Table 7 and Table 9respectively:

Table 5: The moderating effect of paradoxical cognition on green behavior and environmental performance

Model 1		**Model 2**	**Model 3**
Constant	4.379** (78.127)	4.379** (79.803)	4.274** (74.183)
Green behavior	0.320** (7.485)	0.234** (5.132)	0.206** (4.604)
Paradoxical cognition		0.211** (4.866)	0.184** (4.282)
Green behavior *			0.148**
paradoxical cognition			(4.970)
Sample size	525	525	525
R^2	0.097	0.136	0.175
Adjusted R^2	0.095	0.133	0.170
F value	F (1,523)=56.030,p=0.000	F (2,522)=41.070,p=0.000	F (3,521)=36.856,p=0.000
R^2	0.097	0.039	0.039
F value	F (1,523)=56.030,p=0.000	F (1,522)=23.680,p=0.000	F (1,521)=24.700,p=0.000

Note(s): Dependent variable: environmental performance; * p<0.05 ** p<0.01; *t*-value in parentheses

As can be seen in Table 5, the interaction term between green behavior and paradoxical cognition is significant (t=4.970, p=0.000<0.05). This means that the moderating variable (paradoxical cognition) has a significant difference in moderating the magnitude of the effect of green behavior on environmental performance at the average (mean), high (mean + standard deviation), and low (mean - standard deviation) levels, which can be seen in Table 6 and the simple slope chart (Figure 3)

Table 6: The Moderating effect of paradoxical cognition on green behavior and environmental performance at different levels

Level of Moderating Variables	Regression Coefficient	Standard Error	t	p	95% CI	
mean	0.206	0.045	4.604	0.000	0.119	0.294
high（+1SD）	0.410	0.057	7.202	0.000	0.298	0.522
low（-1SD）	0.003	0.064	0.044	0.965	-0.123	0.129

Simple slope chart (Figure 3) shows the differences in the magnitude of the effect of green behaviors on environmental performance when the moderating variable, paradoxical cognition, is at different levels.

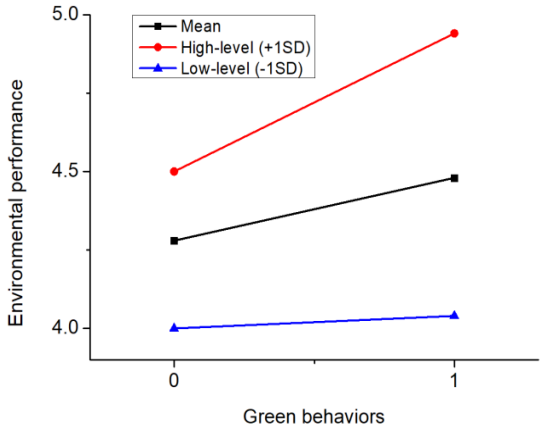

Figure 3: Simple slope chart of the regulation effect of paradoxical cognitive (I)

The magnitude of the slope of the straight line in Figure 3 reflects the varying degrees of impact of green behavior on environmental performance. The slope of paradoxical cognition is significantly larger at high levels and smaller at low levels, indicating that the impact of green behavior on environmental performance is significantly increased at high levels of paradoxical cognition, and the impact is relatively small when the paradoxical cognition is at low levels, leading to the establishment of H2a.

Table 7: The moderating effect of paradoxical cognition on green behavior and economic performance

Model 1		Model 2	Model 3
Constant	4.355** (79.893)	4.355** (81.614)	4.262** (75.768)
Green behavior	0.394** (9.481)	0.310** (7.005)	0.286** (6.531)
Paradoxical cognition		0.206** (4.877)	0.181** (4.333)
Green behavior *			0.132**
paradoxical cognition			(4.521)

Sample size	525	525	525
R^2	0.147	0.184	0.215
Adjusted R^2	0.145	0.181	0.210
F value	F (1,523)=89.855,p=0.000	F (2,522)=58.793,p=0.000	F (3,521)=47.469,p=0.000
R^2	0.147	0.037	0.031
F value	F (1,523)=89.855,p=0.000	F (1,522)=23.785,p=0.000	F (1,521)=20.443,p=0.000

Note(s): Dependent variable: economic performance; * p<0.05 ** p<0.01; *t*- value in parentheses

As can be seen in Table 7, the interaction term between green behavior and paradoxical cognition is significant (t=4.521, p=0.000<0.05). This means that the moderating variable (paradoxical cognition) has a significant difference in moderating the magnitude of the effect of green behavior on economic performance at the average (mean), high (mean + standard deviation), and low (mean - standard deviation) levels, which can be seen in Table 8 and the simple slope chart (Figure 4).

Table 8: The Moderating effect of paradoxical cognition on green behavior and economic performance at different levels

Level of Moderating Variables	Regression Coefficient	Standard Error	t	p	95% CI	
Mean	0.286	0.044	6.531	0.000	0.200	0.372
High（+1SD）	0.467	0.056	8.396	0.000	0.358	0.576
Low（-1SD）	0.105	0.063	1.673	0.095	-0.018	0.228

The simple slope plot (Figure 4) shows the differences in the magnitude of the impact of green behavior on economic performance at different levels of moderating variable (paradox cognition).

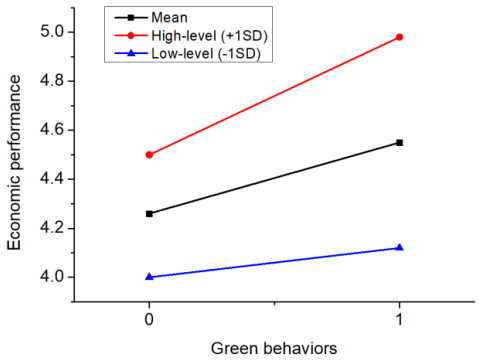

Figure 4: Simple slope chart of the regulation effect of paradoxical cognitive (II)

The magnitude of the slope of the straight line in Figure 4 reflects the varying degrees of impact of green behavior on economic performance. The slope of paradoxical cognition is significantly larger at high levels and smaller at low levels, indicating that the impact of green behavior on economic performance is significantly increased at high levels of paradoxical cognition, and the impact is relatively small when the paradoxical cognition is at low levels, which can be deduced that H2b is established.

Table 9: The moderating effect of paradoxical cognition on green behavior and operational performance

Model 1		Model 2	Model 3
Constant	4.446** (79.566)	4.446** (80.467)	4.338** (74.861)

Green behavior	0.365** (8.551)	0.300** (6.553)	0.272** (6.037)
Paradoxical cognition		0.157** (3.594)	0.128** (2.980)
Green behavior * paradoxical cognition			0.153** (5.103)
Sample size	525	525	525
R^2	0.123	0.144	0.185
Adjusted R^2	0.121	0.141	0.180
F value	F (1,523)=73.124,p=0.000	F (2,522)=43.853,p=0.000	F (3,521)=47.469,p=0.000
R^2	0.123	0.021	0.041
F value	F (1,523)=73.124,p=0.000	F (1,522)=12.916,p=0.000	F (1,521)=20.443,p=0.000

Note(s): Dependent variable: operational performance; * p<0.05 ** p<0.01; *t*- value in parentheses

As can be seen in Table 9, the interaction term between green behavior and paradoxical cognition is significant (t=5.103, p=0.000<0.05). This means that the moderating variable (paradoxical cognition) has a significant difference in moderating the magnitude of the effect of green behavior on operational performance at the average (mean), high (mean + standard deviation), and low (mean - standard deviation) levels, which can be seen in Table 10 and the simple slope chart (Figure 5).

Table 10: The Moderating effect of paradoxical cognition on green behavior and operational performance at different levels

Level of Moderating Variables	Regression Coefficient	Standard Error	t	p	95% CI
Mean	0.272	0.045	6.037	0.000	0.184 0.361
High（+1SD）	0.482	0.057	8.426	0.000	0.370 0.595
Low（-1SD）	0.062	0.065	0.958	0.338	-0.065 0.189

Simple slope chart (Figure 5) shows the differences in the magnitude of the effect of green behaviors on operational performance when the moderating variable, paradoxical cognition, is at different levels.

Figure 5. Simple slope chart of the regulation effect of paradoxical cognitive (III)

The magnitude of the slope of the straight line in Figure 5 reflects the varying degrees of impact of green behavior on operational performance. The slope of paradoxical cognition is significantly larger at high levels and smaller at low levels, indicating that the impact of green behavior on operational performance is significantly increased at high levels of paradoxical cognition, and the impact is relatively small when the paradoxical cognition is at low levels, which can be deduced that H2c is established.

6. DISCUSSION

6.1 Research conclusion

The results of the study show that from the aspect of the model path, green behaviors have a significant positive impact on environmental, economic and operational performance in green performance, with a greater impact on economic performance (β=0.436) (range of coefficients: -1 to 1)), followed by operational performance (β=0.396) and environmental performance (β=0.357).

The improvement of economic benefits in turn strengthens the willingness and initiative of enterprises to implement green behavior. In addition, paradoxical cognition plays a positive moderating role in the impacts of green behavior on environmental, economic, and operational performance (environmental performance t=4.970; economic performance t=4.521; operational performance t=5.103), indicating that economic benefits and executives' perceptions of the paradoxical relationship between green behavior and green performance have a positive promoting effect on the transformation of green performance. The tendency of enterprises to pursue maximum benefits enhances their subjective initiative in implementing green behaviors. Green products or services recognized by the public and consumers bring more environmental and economic performance to enterprises, and the improvement of economic performance in turn stimulates their green behavior. Compared with external pressure, the internal driving force of green behavior is stronger, the behavior is more sustainable, thus leading to higher efficiency of enterprise green transformation. The virtuous cycle mechanism of green behavior and green performance demonstrates the possibility and effectiveness of implementing enterprise green transformation in a comprehensive and efficient way, and also provides strong support for realizing the sustainable development goals of energy saving, emission and pollution reduction, which helps promote the process of enterprise green transformation and the sustainable development of the economy and society.

6.2 Management inspiration

The ways and methods to enhance the subjective initiative of green behavior in logistics enterprises in this study provide certain reference and inspiration for the green transformation of logistics enterprises. From the perspective of enterprises, they should comply with the trend and requirements of green transformation, enhance their awareness of resource conservation and environmental protection responsibilities, cultivate the awareness of green competitive advantages among enterprise managers, respond positively to environmental policy regulations and consumer demand for green consumption, strengthen the implementation of green behaviors, and integrate them into all aspects of enterprise operation and management. For logistics enterprises, green logistics behavior refers to the behavior of logistics enterprises to achieve the maximum economic, social and environmental benefits with the least resource consumption and environmental pollution in their daily operations, which mainly includes green packaging, energy-saving transportation, reduction of carbon emission and cargo losses, route and supply chain optimization, environmentally friendly warehousing, green procurement and environmental protection awareness education. In addition, the government, environmental protection departments, and industry organizations should fully utilize policy incentives to encourage green behaviors, and provide resource support for enterprises' green behaviors through tax/fee reductions and exemptions, the provision of environmental protection subsidies, or the refund of deposits, thereby encouraging enterprises to effectively transform environmental protection initiatives into environmental protection performance (Ren et al., 2018), and achieve a win-win situation for both economic and environmental performance.

6.3 Limitations and future study

Despite the innovative nature of this study, there are some limitations. First, the sample of the study was from logistics companies, so the generalizability of the findings needs to be supported by more relevant future research results in other fields. Second, the sample data for future studies can be expanded to more than 1000 in different regions or countries to improve the generalizability and persuasiveness of the findings. Finally, in addition to the intrinsic driving forces of green behavior that are the focus of this study, future research can be extended to all the influencing factors that can enhance the subjective initiative of enterprises to implement green behavior, so as to make the green behavior driving force stronger and more sustainable.

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