

Article

How to Embrace Sustainable Performance via Green Learning Orientation: A Moderated Mediating Model

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Abstract: Manufacturing enterprises have realized that organizational learning is conducive to the development of environmental and economic sustainability. However, prior literature has paid less attention to how green learning orientation affects sustainable performance. Based on organizational learning theory, this article constructs a moderated mediating model of the impact of green learning orientation on sustainable performance, using green innovation behavior as the mediating variable and corporate social responsibility (CSR) as the moderating variable. Through the empirical analysis of 193 valid questionnaires from middle and senior managers in Chinese manufacturing enterprises, the results show that green learning orientation positively affects green innovation behavior and sustainable performance, green innovation behavior plays a partial mediating role between green learning orientation and sustainable performance, the relationship between green learning orientation and green innovation behavior depends on CSR, and the mediating effect of green innovation behavior is moderated by CSR. The results provide a theoretical basis and practical implications for promoting green learning and improving sustainable performance of enterprises.

Keywords: green learning orientation; green innovation behavior; sustainable performance; corporate social responsibility



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1. Introduction

Rapid economic growth has given rise to a series of environmental problems, such as resource constraints, environmental pollution, and carbon emissions. The “tragedy of the commons” has caused pollution and resource depletion. With the rapid development of China’s economy, the environmental problem has become a crucial issue of great concern to the Chinese government. The Chinese government calls for green, eco-friendly, high-efficiency and sustainable development. To pursue dual carbon goals (carbon peaking and carbon neutrality) and promote the construction of ecological civilization and green development, China’s government has paid much attention to economic development and ecological sustainability. Manufacturing is pivotal for the rapid economic growth of China, which is also one of the biggest industries that cause resource consumption and environmental pollution. It is crucial to explore the sustainable development of Chinese manufacturing enterprises.

As more environmental issues are reported, enterprises need to take responsibility for environmental and nature conservation [1]. The performance of enterprises is no longer regarded solely through the goal of maximizing their economic value, and social and environmental performance are equally important [2]. Introducing advanced green innovation concepts to achieve sustainable development has become urgent for economic growth [3]. Therefore, the concept of sustainable performance has received widespread attention. It is necessary to increase knowledge related to green production practices for an enterprise to achieve sustainable performance [4]. Only by continuous learning can enterprises achieve a breakthrough in green production in the current production operations [5].

Scholars have been paying more attention to the sustainable performance of enterprises. To deal with external pressure, enterprises need to implement green transformation [6]. It is acknowledged that enterprises should invest various resources to exploit green opportunities [7]. Green learning orientation can encourage enterprises to commit to acquiring, understanding, and exploiting green knowledge [8]. Many enterprises attempt to identify and exploit green opportunities to achieve good sustainable performance. Green learning orientation is the trend of enterprises attaching importance to the creation and exploitation of green knowledge [8]. Enterprises with a strong green learning orientation will consciously adopt green learning, which is conducive to green innovation [9]. Therefore, green learning orientation can make enterprises become learning organizations, which will enable them to invest resources to acquire and create green knowledge to achieve sustainable performance through green innovation [10]. Prior literature has devoted much attention to verifying how organizational learning affects innovation and business performance [11]. For example, March [12] discussed the relationship between organizational learning and innovation. Vowles [13] suggested that organizational learning could help organizations achieve a competitive advantage. To deal with the external pressure of environmental protection, enterprises should invest more resources into green innovation and sustainable development [14]. However, few studies have explored the specific pathway by which green learning orientation affects sustainable performance. Specifically, the internal process and boundary conditions behind the above relationship have not been paid enough attention. In this context, it is crucial to explore how green learning orientation affects sustainable performance of enterprises, including the mediating path and the boundary conditions.

Given that it grows in a highly competitive environment, it is necessary for an enterprise to become a learning-oriented or innovative organization [15]. Organizational learning is a knowledge-based resource capability that is critical for enterprises to strengthen their innovation ability and performance in a changing and competitive environment [11]. Green learning orientation causes enterprises to acquire and create green knowledge, which means that enterprises can automatically and effectively transfer and use green knowledge [16]. Organizational learning theory highlights that learning from experience can change organizational behavior and thus improve business performance [17]. Innovation is an important outcome of organizational learning, and enterprises can acquire, absorb, create, and exploit new information and knowledge to explore new products, processes, and services [12]. Existing studies regard learning orientation as the degree to which an organization invests resources in learning activities [18]. A high-level learning-oriented organization will actively enhance its capabilities and update the knowledge base [13]. Therefore, when enterprises can effectively apply the obtained green knowledge to green innovation, green learning orientation can bring higher sustainable performance. Some studies suggest that green innovation behavior can contribute to promoting the economic and environmental performance of enterprises [19], helping to achieve sustainable performance [20]. Therefore, we attempt to explore the mediating effect of green innovation behavior between green learning orientation and sustainable performance, in order to accurately understand how green learning orientation promotes sustainable performance.

In addition, the effect of green learning orientation on sustainable performance via green innovation behavior may depend on CSR. Prior studies found that organizational culture management plays an important role in enterprise management strategy [21]. The corporate culture embedded in an organization reflects the organizational values and standards that cause enterprises to deal with issues [22]. CSR is defined as an organizational culture of voluntarily considering social and environmental issues, particularly during interactions with stakeholders [23]. The development of CSR helps enterprises to satisfy the requirements of environmentalism [24] and is closely related to environmental practices such as green design, green marketing, and green production [25]. Some studies have indicated that organizational culture can promote innovation, implement environmental strategy [26], and finally promote society development and welfare [27]. However, few

studies have discussed the influence of CSR on green innovation from the perspective of environmental management. CSR may moderate the mechanism by which green learning orientation affects sustainable performance, because CSR can enhance the organizational innovative atmosphere [23]. Therefore, this study regards CSR as the moderating variable and explores the moderating effect of CSR on the relationship among green learning orientation, green innovation behavior, and sustainable performance.

In summary, existing studies indicated that organizational learning has an impact on an enterprise's innovation behavior and performance development, but they paid less attention to the link between green learning orientation, green innovation behavior, and sustainable performance from the perspective of environmental management. First, this study explores how green learning orientation affects sustainable performance based on organizational learning theory. Second, this study explores the indirect effect of green learning orientation on sustainable performance, regarding green innovation behavior as the mediating variable. Third, the moderated mediating model is adopted to explore how CSR moderates the mediating impact of green innovation behavior. This study contributes to strengthening the understanding of how green learning orientation affects sustainable performance under the logic of "learning-behavior-performance". Furthermore, this study empirically sheds light on how to best integrate green learning orientation with green innovation behavior and CSR, which can enable enterprises to achieve better sustainable performance.

2. Literature Review and Hypotheses

2.1. Green Learning Orientation and Sustainable Performance

The issues of sustainability are becoming increasingly of concern. This is especially true in emerging economies, where environmental issues are more noteworthy, because they consume more energy and natural resources [28]. Sustainable performance is defined as the ability of companies to reduce harmful emissions and improve green innovation to maintain a long-term competitive advantage [10,29]. Prior research has suggested that learning green knowledge can help enterprises to achieve a breakthrough in green production [4]. Organizational learning theory suggests that learning new knowledge related to product, service, and process management can facilitate innovation and improve performance [17]. Therefore, green knowledge learning related to sustainable development helps enterprises to improve green innovation and sustainable performance.

Green learning orientation is defined as the common value that guides enterprises to learn green knowledge [30]. With green cultural values, employees will acquire, share, exploit, and create green knowledge, which will significantly contribute to the performance of any organization [8]. First, green learning orientation develops green-related capabilities by guiding employees to gain environmental knowledge and learn about green technology to improve product design and customer satisfaction [31]. Second, green learning orientation enhances green commitment by improving employees' motivation and participation in green activities to reduce hazardous emissions and improve resource conservation [31]. Third, green learning orientation contributes to the exchanging and sharing of green knowledge within the organization, which can expand and update the knowledge base of enterprises, help enterprises to implement green innovation behavior, and play a vital role in improving sustainable performance [8]. Therefore, we propose that:

Hypothesis 1 (H1). *Green learning orientation is positively related to sustainable performance.*

2.2. Green Learning Orientation and Green Innovation Behavior

Green innovation refers to a process in which enterprises explore new green products, processes, and services to achieve economic benefits by continuously implementing energy conservation, pollution prevention, and environmental quality improvement [32]. To overcome environmental pressures, the exchange and integration of green knowledge based on environmentally friendly requirements is a crucial factor affecting green innovation and

management [8]. It is necessary for innovation to enhance the capabilities of knowledge acquisition, application, sharing, and creation. That is to say, learning orientation has an important impact on improving innovation ability [8].

Green learning orientation affects the learning direction of enterprises and the attitude of employees towards acquiring new skills [33], guides employees to create and exploit green knowledge, and can promote employees to actively participate in green innovation [34]. Under the influence of knowledge-sharing values, employees will think actively about how to acquire and exchange knowledge [16], which will strengthen employees' ideas of environmental management and promote green innovation behavior. Specifically, green learning orientation causes organizations to invest resources into acquiring knowledge related to green production, thus enriching the green knowledge base of organizations [16]. Furthermore, abundant green knowledge will contribute to green innovation [2]. Therefore, green learning orientation is conducive for enterprises to acquiring, sharing, and creating environmental knowledge about consumers and the market and exploring new ideas about green innovation. Therefore, we proposed that:

Hypothesis 2 (H2). *Green learning orientation is positively related to green innovation behavior.*

2.3. The Mediating Role of Green Innovation Behavior

Organizational learning theory suggests that enterprises need to acquire and create knowledge through learning to develop competitive advantages [12]. Green knowledge enhances the organizational ability to develop green practice or behavior [17]. Green innovation behavior is a creative behavior related to environmental issues, defined as generating creative ideas about environmental protection through product design and new technologies' application in cleaner production processes [19]. Green learning orientation can enhance enterprises' ability to accurately identify, integrate, and exploit green knowledge related to product and process innovation, so as to promote green innovation behavior [16]. Sustainable performance is dependent on the adoption of green practices or behavior [35].

Additionally, green learning orientation, which reflects green organizational identification [8], can enhance employees' green commitment to the organization and thus promote green innovation behavior [10]. Green innovation behavior can reduce environmental pollution through green product and process innovation and provide customers with green products that meet their green demands to achieve sustainable performance [20]. Therefore, green innovation behavior plays an important mediating role in the relationship between green learning orientation and sustainable performance. Therefore, we proposed that:

Hypothesis 3 (H3). *Green innovation behavior mediates the relationship between green learning orientation and sustainable performance.*

2.4. The Moderating Role of CSR

CSR refers to an organizational culture of voluntarily considering social and environmental issues in the process of interaction with stakeholders [23]. CSR also reflects the corporate values that shape the green management style and direct attention to social issues [36]. To address the pressure of environmental protection, enterprises have incorporated CSR as an important part of business strategic management [25]. Enterprises with high CSR attach importance to environmental protection and sustainable development and integrate the concept of environmental protection into the product and process innovation [27]. These organizations pay more attention to the balance between business operations and environmental protection [37].

First, organizational culture can create situations for enterprises to effectively learn, acquire, and use knowledge [38]. When enterprises regard environmental protection as a social responsibility, the organizational culture can help enterprises comply with environmental regulations, predict business environmental impact, and take measures to

reduce resource waste and environmental pollution [34]. A high-level CSR asks enterprises to search for, acquire, share, and use knowledge related to green production, which will promote green innovation to reduce environmental pollution and resource waste [25]. CSR can promote the impact of green learning orientation on green innovation behavior. Therefore, we proposed that:

Hypothesis 4 (H4). *CSR positively moderates the relationship between green learning orientation and green innovation behavior.*

Second, CSR enables organizational members to take actions under a common value system [39] and may be linked to organizational performance [25]. To address the external pressure of legitimacy, enterprises need to build a CSR [36]. In a dynamic environment, environmental management becomes crucial for companies, and many companies are willing to devote their energy to developing green innovation [40]. The enterprises with high-level CSR pay much attention to environmental issues [10], which makes them acquire, share, create, and exploit knowledge related to green products and process innovation and then promote green innovation to achieve good sustainable performance. Therefore, we proposed that:

Hypothesis 5 (H5). *CSR positively moderates the mediating effect of green innovation behavior in the relationship between green learning orientation and sustainable performance.*

The conceptual framework is shown in Figure 1. We constructed a moderated mediating model in which CSR moderates the mediating effect of green innovation behavior in the relationship between green learning orientation and sustainable performance.

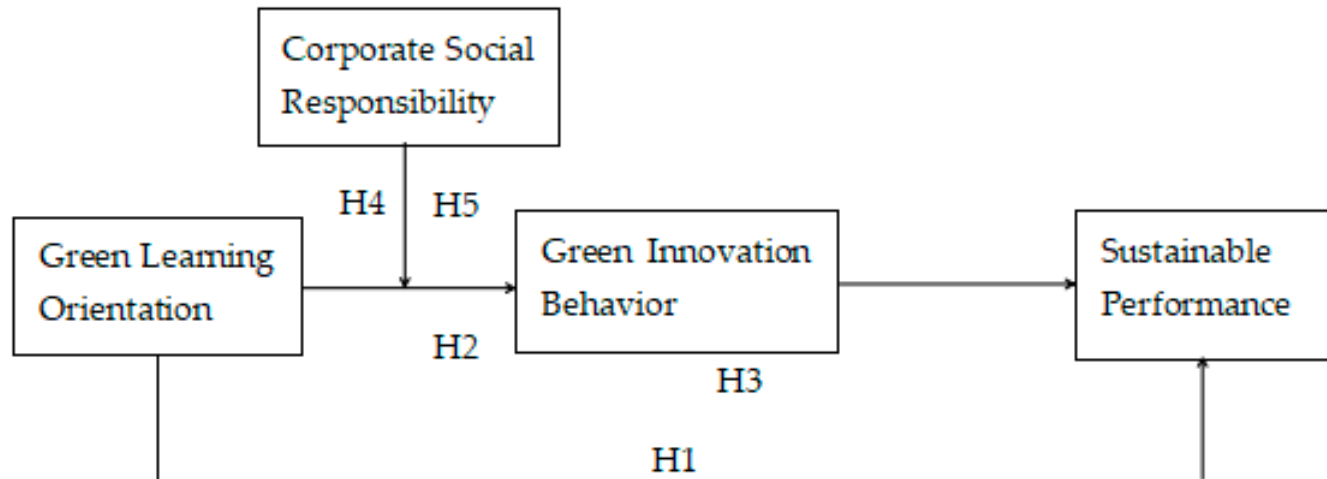


Figure 1. Conceptual model.

3. Research Methodology

3.1. Samples and Data Collection

Given the Chinese government's great concern on environmental issues, we selected Chinese manufacturing enterprises for the questionnaire survey. First, northeast China is an important old industrial base in China. Manufacturing enterprises in northeast China have a long development history and are also facing the pressure of economic transformation. In order to revitalize the old industrial base in northeast China, green practices have become an important issue of great concern in northeast China. Second, Yangtze River Delta region has always been one of the important manufacturing regions in China, and the rapid economic development and increase in industrial production in the Yangtze River Delta region have led to serious ecological pollution problems. In order

to achieve sustainable development and address the environmental pressure from the government and the market, manufacturing enterprises in the Yangtze River Delta region are also very concerned about green innovation. Therefore, manufacturing enterprises in northeast China and Yangtze River Delta region were selected as research samples. Based on the study of Xie and Zhu [10], the samples in this study needed to meet the following conditions: (1) manufacturing; (2) having been committed to corporate sustainability for at least the past three years.

First, two English professional translators and one management expert were invited to translate all the original English scales into Chinese and conduct reverse translation. Second, twelve business managers were asked to test comprehension of the translated language and the ambiguity to verify whether the content validity of the translated scale was good. Finally, we adopted the convenient sampling method to acquire the data. From October 2020 to May 2021, we acquired a list of enterprises with the help of MBA and EMBA alumni, training institutions with a cooperative relationship, and professional market research companies. We contacted the middle and senior managers or the managers of technical departments to answer the questionnaire. Questionnaires were distributed to the middle and senior managers and technical department managers of manufacturing enterprises in northeast China and the Yangtze River Delta region by field investigation and email. Then, we used snowballing method to acquire more enterprises, which is conducive to acquiring data from hard-to-reach respondents [2]. The answering was anonymous, and the results would be provided to the respondents to promote a valid response. A total of 500 questionnaires were distributed, and 243 questionnaires were obtained, including 193 valid questionnaires, with an effective recovery rate of 38.6%.

At the individual level of characteristics, there are more male respondents (53.4%) than female respondents (46.6%). In terms of age, the largest age group is 36–45 years old, accounting for 31.1%. A total of 26.4% of the respondents are 46–55 years old, 22.3% are 26–35 years old, 16.1% > 55 years old, and 4.1% < 25 years old. In terms of educational level, 73.1% of the respondents have bachelor degrees or above, and 26.9% just accepted education until high school. In terms of work experience, 68.9% of the respondents have been working for more than 6 years, and 31.1% of the respondents have been working for less than 6 years. In terms of position, the largest group is the middle and senior managers, accounting for 81.9% of the total sample. A total of 18.1% of the respondents are technical supervision and managers. Furthermore, 32.1% of respondents are in production sector, 23.8% in human resource management, 19.2% in finance departments, 18.1% in R & D sector, and 6.7% in market sector.

At the organizational level characteristics, 61.7% of businesses are private businesses, 22.3% are state owned enterprises, and 16.0% foreign capital enterprises. In terms of industry, the electrical and electronic equipment manufacturing industry accounts for the highest proportion (26.9%), the second largest proportion is garment manufacturing (21.8%), and then food industry, chemical industry, medical supply industry, automotive manufacturing, and others account for 18.7%, 15.5%, 7.3%, 4.7%, and 5.2%, respectively. In terms of firm size, 98.4% of the enterprises have fewer than 1000 employees, while only 1.6% have more than 1000 employees. In terms of firm age, 96.9% of enterprises have less than 20 years of operation, and 3.1% have more than 20 years of operation. In the past three years, 72.9% of companies have had three or more green products, while 27.1% have had fewer than three kinds of green products.

3.2. Measurement of Variables

All the measurement scales in this study were 7-point Likert scales, ranging from 1 (strongly disagree) to 7 (strongly agree). First, we used 4 items to measure sustainable performance based on Xie and Zhu [10]. Second, the measurement of green learning orientation was used, referring to the studies of Fong and Chang [8] and Sheng and Chien [40], including 4 items. Third, we used 3 items to measure the green innovation behavior, which were adopted from Long et al. [19]. Finally, the measurement of CSR was

adopted with 5 items from the study of Yu and Choi [38]. Appendix A lists the constructs' details and items.

Additionally, previous studies showed that enterprise background may affect sustainable performance [10], and this study controlled for variables such as business ownership, industry, enterprise size, enterprise age, and number of green products (number of green products produced in the previous three years).

4. Results

4.1. Common Method Variance Test

To prevent and reduce common method variance (CMV), we adopted procedural control and post-statistical control based on the study of Podsakoff et al. [41]. First, we used anonymous filling, reverse items, and item order randomization to reduce CMV in programming. Second, we performed a Harman single-factor test. The first factor did not exceed half of the total explanation, accounting for 37.173% of the total variance. Third, we conducted a confirmatory factor analysis (CFA) to further test CMV. As shown in Table 1, we linked all items to a single factor, and the single-factor model did not fit the data well ($\chi^2 = 1040.086$, $df = 104$, $\chi^2/df = 10.001$, $p < 0.001$, CFI = 0.494, TLI = 0.416, RMSEA = 0.217). The results suggest that the CMV problem was not a serious concern. Fourth, we adopted a single-common-method-factor approach to test CMV [41]. The fitting indexes of the model ($\chi^2 = 99.655$, $df = 82$, $\chi^2/df = 1.215$, CFI = 0.990, TLI = 0.986, RMSEA = 0.033) were good. However, compared with the theoretical model, no fitting index was significantly improved, which also indicates that the CMV problem was not a serious issue. Finally, we also used the marker-variable technique based on Lindell and Whitney's [42] study to test CMV. According to the study of Malhotra et al. [43] and Chan et al. [44], we adopted the respondent's working function as the marker variable, which should be theoretically irrelevant to other variables. The average correlation between the marker variable and the variables of conceptual model was represented by rm ($rm = 0.026$). We used the t test to examine if ru and ra were different significantly. The results show that the change ($ru-ra$) of correlation coefficients for all constructs was not significant when the effect of rm was removed. Therefore, CMV of this study may not be a serious problem.

Table 1. Results of Confirmatory factor analysis.

Model	χ^2	df	χ^2/df	RMSEA	TLI	CFI
Four-factor Model	123.968	98	1.265	0.037	0.983	0.986
Three-factor Model	377.553	101	3.738	0.119	0.822	0.850
Two-factor Model	692.940	103	6.728	0.173	0.628	0.681
Single-factor Model	1040.086	104	10.001	0.217	0.416	0.494

Note: The four-factor model is a theoretical model, including green learning orientation, green innovation behavior, sustainable performance and CSR; three-factor model: combine sustainable performance and green learning orientation into one factor; two-factor model: combine sustainable performance and green learning orientation into one factor, combine green innovation behavior and corporate CSR into one factor; one-factor model: focus all items into one factor.

4.2. Reliability and Validity

As shown in Table 2, we used SPSS22.0 and Amos26.0 to test the reliability and validity of all the variables. The results show that Cronbach's α coefficients for sustainable performance, green learning orientation, green innovation behavior, and CSR are greater than 0.7, and all the factor loadings are greater than 0.7, indicating all the variables have good reliability. Additionally, the average variance extracted (AVE) values were all above 0.5, and the composite reliability (CR) values were all above 0.7, indicating that the convergent validity is acceptable. As shown in Table 1, the structure of the scales were tested using a CFA, and the result of the four-factor model showed a good fit between the observed data and the conceptual model ($\chi^2 = 123.968$, $df = 98$, $\chi^2/df = 1.265$, $p < 0.001$, CFI = 0.986, TLI = 0.983, RMSEA = 0.037). This result indicates good discriminant validity. We also

adopted HTMT to test the discriminant validity. Following the suggestion of Hair et al. [45], the cut-off for HTMT should be less than 0.900. The results of HTMT in Table 3 show that all the values between every two variables were less than 0.900 and indicate that the constructs were accepted and the discriminant validity was sufficient. As shown in Table 4, the correlation between the two latent constructs was less than the square root of the AVE estimates for each individual construct, indicating sufficient discriminant validity.

Table 2. Results of Exploratory factor analysis.

Constructs	Label	Factor Loading	Cronbach's α	CR	AVE
SP	SP1	0.850	0.862	0.907	0.709
	SP2	0.833			
	SP3	0.840			
	SP4	0.846			
GLO	GLO1	0.894	0.910	0.937	0.788
	GLO2	0.875			
	GLO3	0.871			
	GLO4	0.910			
GIB	GIB1	0.892	0.866	0.918	0.789
	GIB2	0.874			
	GIB3	0.898			
CSR	CSR1	0.847	0.901	0.927	0.717
	CSR2	0.854			
	CSR3	0.844			
	CSR4	0.844			
	CSR5	0.845			

Table 3. HTMT analysis.

Factors	SP	GLO	GIB	CSR
SP	1.000			
GLO	0.507	1.000		
GIB	0.508	0.639	1.000	
CSR	0.080	0.239	0.329	1.000

Table 4. Means, standard deviations, and correlation.

Variable	1	2	3	4	5	6	7	8	9
1 Ownership									
2 Industry	0.046								
3 Firm Size	0.076	0.128							
4 Firm Age	−0.003	0.072	0.021						
5 GP	0.192 **	0.069	0.129	0.043					
6 SP	0.225 ***	0.257 ***	0.193 **	0.018	0.288 ***	0.842			
7 GLO	0.233 **	0.319 ***	0.156 *	0.081	0.221 **	0.450 ***	0.888		
8 GIB	0.201 **	0.254 ***	0.133	0.163 *	0.223 **	0.439 ***	0.568 ***	0.888	
9 CSR	0.077	0.122	0.257 ***	0.114	0.365 ***	0.034	0.215 **	0.291 ***	0.847
Mean	2.394	4.264	2.306	2.782	1.974	5.965	5.492	5.494	4.503
S.D.	0.829	1.482	0.893	1.082	0.881	0.891	1.478	1.350	0.993

Note: S.D. = standard deviation; GP = number of green products; SP = sustainable performance; GLO = green learning orientation; GIB = green innovation behavior; CSR = corporate social responsibility; similarly hereinafter. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The diagonal elements are square roots of AVE.

4.3. Hypothesis Testing

Table 4 lists the means, standard deviations, and correlations of all the variables. First, there were significant correlations between control variables and some variables, indicating that the selection of control variables in this study was reasonable. Second, except for the relationship between sustainable performance and corporate social responsibility culture

not being significant, the relationships between any two variables are significant, indicating that the results provide the foundation for further hypothesis testing.

We tested the multicollinearity before hypothesis testing. The largest variance inflation factor (VIF) in the regression analysis was less than the cut-off ($VIF < 2$). Therefore, the multicollinearity problem was not a serious concern. We adopted SPSS 22.0, Amos 26.0, and PROCESS plug-in software to test the hypotheses by using hierarchical regression and the Bootstrap method.

4.3.1. Direct Effect

The results of regression analysis are shown in Table 5. Model 1 shows that ownership ($\beta = 0.162, p < 0.05$), industry ($\beta = 0.219, p < 0.01$), and number of green products ($\beta = 0.226, p < 0.01$) have positive impacts on sustainable performance. We added green learning orientation to Model 2, and the result shows that green learning orientation affects sustainable performance positively ($\beta = 0.336, p < 0.001$). H1 is supported.

4.3.2. Mediating Analysis

Model 5 in Table 5 verified the effect of all controlled variables on green innovation behavior. Enterprise ownership ($\beta = 0.154, p < 0.05$), industry ($\beta = 0.216, p < 0.01$), firm age ($\beta = 0.139, p < 0.05$), and number of green products ($\beta = 0.163, p < 0.05$) have positive impacts on green innovation behavior. Model 6 shows that green learning orientation has a positive influence on green innovation behavior ($\beta = 0.496, p < 0.001$), supporting H2.

Model 3 shows that green innovation behavior has a positive impact on sustainable performance ($\beta = 0.338, p < 0.01$), and Model 4 shows that the effect of green learning orientation on sustainable performance was reduced compared with Model 2 (the regression coefficient drops from 0.336 to 0.221). Therefore, green innovation behavior plays a partial mediating role in the relationship between green learning orientation and sustainable performance. H3 is supported.

To further verify the mediating effect, we adopted a Sobel test based on Thuy et al.'s studies [46,47]. The results in Table 6 show that the mediating influence of green innovation behavior on the relationship between green learning orientation and sustainable performance is significant. According to Baron and Kenny's [48] methodology, green innovation behavior plays a partial mediating role between green learning orientation and sustainable performance. According to Zhao et al.'s [49] study, the mediation of green innovation behavior is complementary. The results in Table 6 show that the mediating effect of green innovation behavior on the link between green learning orientation and sustainable performance accounts for 34.2% of the overall effect. The indirect effect is more than the half of the direct effect. Therefore, green learning orientation has a positive effect on the sustainable performance, with green innovation behavior as a mediator (see Table 6).

4.3.3. The Moderating Effect of CSR

Model 7 indicates that the interaction term product of green learning orientation and CSR has a positive effect on green innovation behavior ($\beta = 0.262, p < 0.001$). It indicates that CSR has a significant positive moderating effect on the relationship between green learning orientation and green innovation behavior. Therefore, H4 is supported (see Table 5).

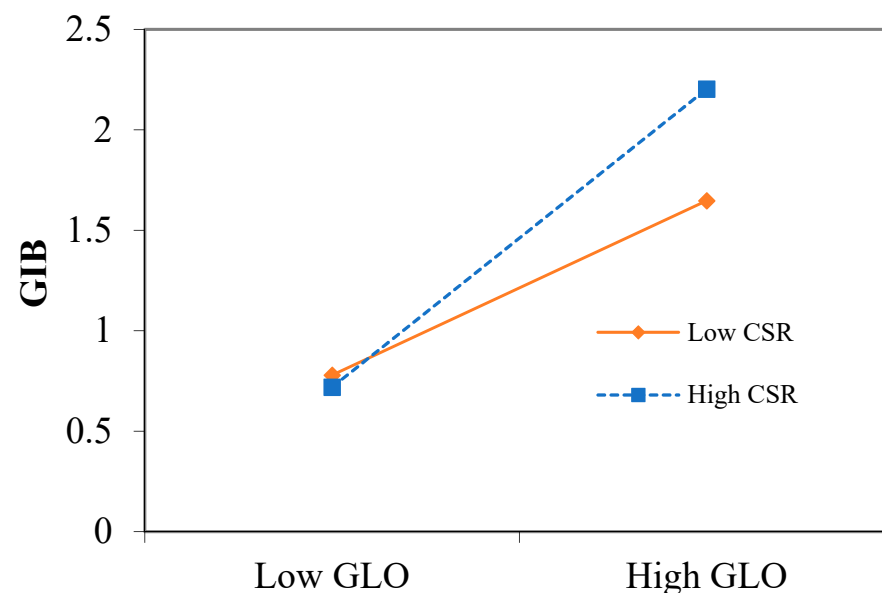
Furthermore, to better understand the moderating effect of environmental dynamism, we plotted the picture of moderation of CSR using mean ± 1 standard deviation for the variables. As shown in Figure 2, the slope of the relationship between green learning orientation and green innovation behavior is greater when CSR is high. Therefore, CSR enhances the positive effect of green learning orientation on green innovation behavior. H4 is supported.

Table 5. Analysis of regression.

Variables	SP					GIB	
	M1	M2	M3	M4	M5	M6	M7
Ownership	0.162 *	0.101	0.110	0.086	0.154 *	0.063	0.052
Industry	0.219 **	0.123	0.145 *	0.105	0.216 **	0.075	0.042
Firm Size	0.124	0.095	0.100	0.089	0.070	0.028	0.006
Firm Age	−0.010	−0.027	−0.057	−0.054	0.139 *	0.113	0.099
GP	0.226 **	0.174 **	0.171 **	0.154 *	0.163 *	0.087	0.003
GLO		0.336 ***		0.221 **		0.496 ***	0.476 ***
GIB			0.338 ***	0.232 **			
CSR							0.183 **
GLOxCSR							0.262 ***
F	8.287 ***	11.665 ***	11.936 ***	11.778 ***	6.823 ***	17.064 ***	17.933 ***
R ²	0.181	0.273	0.278	0.308	0.154	0.355	0.438
Adj R ²	0.159	0.250	0.255	0.282	0.132	0.334	0.414

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.**Table 6.** Sobel test.

Estimates	Delta	Sobel	Monte Carlo *
Indirect effect	0.093	0.093	0.093
SE	0.032	0.032	0.028
z-Value	3.312	3.312	3.354
p-Value	0.001	0.001	0.001
Conf. Interval	0.039, 0.161	0.039, 0.161	0.039, 0.165
(Indirect effect/total effect)		(0.093/0.271) = 0.342	
(Indirect effect/direct effect)		(0.093/0.178) = 0.520	
Baron and Kenny approach		Partial mediation	
Zhao, Lynch, and Chen's approach		Complementary mediation	

* $p < 0.1$.**Figure 2.** Moderating effect of CSR.

4.3.4. The Moderating Mediating Effect

To verify the moderating effect of CSR on the mediating effect of green innovation behavior, we constructed a moderated mediating effect model. The PROCESS plug-in of SPSS was used to test the moderated mediating effect of the linear model, with green innovation behavior as the indirect variable. Bootstrap sampling was set 5000 times with 95% confidence intervals, and Model 7 was selected for testing. The moderating variable was divided into high, middle, and low groups according to mean ± 1 standard deviation

to verify the indirect influence of green learning orientation on sustainable performance at different levels of CSR. The results suggest that CSR positively moderates the mediating effect of green innovation behavior in the relationship between green learning orientation and sustainable performance. The effect index is 0.027, and the confidence interval is [0.009, 0.060], which does not contain 0 (see Table 7). Thus, H5 is supported.

Table 7. Moderated Mediating effects at different CSR levels.

Moderating Variable	Conditional Indirect Effects				Moderated Mediating Effect			
	Indirect Effects	Boot SE	95% Confidence Interval		INDEX	Boot SE	Boot LLCI	Boot ULCI
			Boot LLCI	Boot ULCI				
L	0.062	0.024	0.025	0.124	0.027	0.013	0.009	0.060
M	0.089	0.031	0.039	0.166				
H	0.116	0.041	0.050	0.215				

4.4. Robustness Test

We performed the robustness test to verify the results' stability. First, the independent variable was divided into two groups of the median of 6.000, and a virtualized independent variable instead of the original variable was used to verify the influence of green learning orientation on green innovation behavior and sustainable performance. The results show that the significance of the relationship between variables was consistent with the original results. Second, the Bootstrap method was adopted using the PROCESS module (an SPSS plug-in) to verify the mediating and moderating effects, and the theoretical model remained unchanged. Third, we used an SEM analysis to test the hypotheses. As shown in Figure 3, green learning orientation positively affects green innovation behavior ($\beta = 0.521$, $p < 0.001$) and sustainable performance ($\beta = 0.298$, $p < 0.001$), and GIB positively affects sustainable performance. CSR positively affects green innovation behavior ($\beta = 0.205$, $p < 0.001$). The interaction between green learning orientation and CSR positively affects green innovation behavior ($\beta = 0.278$, $p < 0.001$). In addition, green learning orientation, CSR, and their interaction contribute to and explain the high-value variance of R^2 of 39.1% in green innovation behavior, and green learning orientation and green innovation behavior contribute to and explain the high-value variance of R^2 of 24.2% in sustainable performance, suggesting that the most reliable relationship is with all dependent variables.

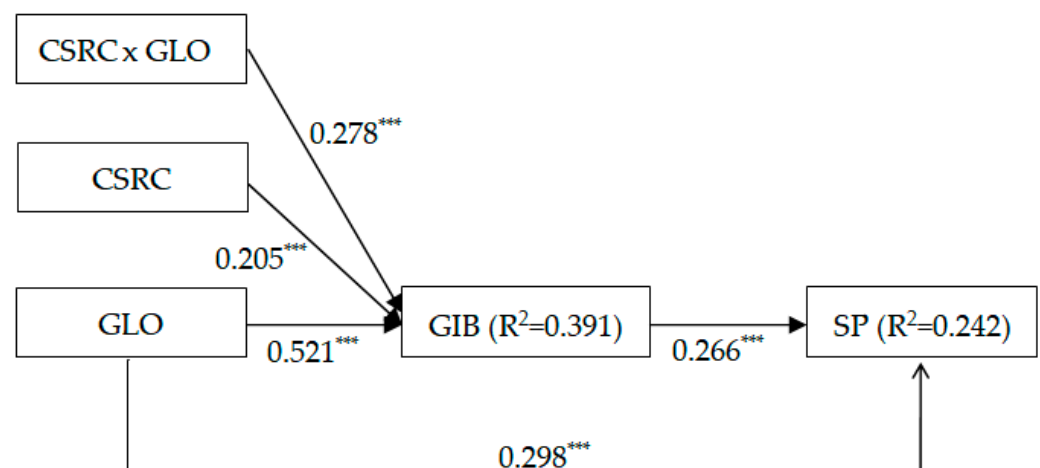


Figure 3. Results of structural model. Note: SP = sustainable performance; GLO = green learning orientation; GIB = green innovation behavior; CSRC= corporate social responsibility; similarly hereinafter. *** $p < 0.001$.

5. Conclusions

5.1. Discussion

Based on organizational learning theory, this study constructs a moderated mediating model to verify the impact of green learning orientation on sustainable performance, using green innovation behavior as the mediating variable and corporate social responsibility culture as the moderating variable. The results suggest that green learning orientation has positive effects on both green innovation behavior and sustainable performance. Green innovation behavior plays a mediating role in the relationship between green learning orientation and sustainable performance. CSR strengthens the relationship between green learning orientation and green innovation behavior and enhances the mediating effect of green innovation behavior in the relationship between green learning orientation and sustainable performance.

First, this paper finds that green learning orientation has a significant positive effect on sustainable performance, which supports the views of Aranda et al. [11]. Aranda et al. [11] suggested that concern about environmental protection is conducive to the sustainable development of enterprises. Green learning orientation directs attention to green knowledge acquisition to sustain a competitive edge and deal with external pressure concerning environmental protection [16]. Prior literature has suggested that learning orientation is important to business performance [50]. Learning orientation can lead organizations' innovation capacity to achieve a competitive advantage [50]. Green learning orientation enables an organization to pay more attention to knowledge related to green production, which helps to improve the organization's green innovation ability and enhance the legitimacy of the organization to deal with external environmental pressure [16]. All of this can help enterprises form differentiated competitive advantages and thus improve business performance [51]. This study expands the research background of existing literature and explores the impact of learning orientation on firm performance from the perspective of sustainability. Enterprises with a strong green learning orientation can acquire green knowledge, enhance green organizational capacity, and strengthen legitimacy, which can promote sustainable performance.

Second, this study has investigated the mediating role of green innovation behavior in the relationship between green learning orientation and sustainable performance based on organizational learning theory. The result indicates that green innovation behavior plays a crucial role in the transformation of green learning orientation into sustainable performance. This conclusion suggests that green learning orientation can facilitate employees to learn green knowledge to develop green innovative behavior, which is consistent with the view of Wang et al. [10]. Further, some studies show that green innovation behavior is pivotal to improving sustainable performance of enterprises [10,20]. Manufacturing enterprises need to obtain differentiated competitive advantages through green innovation and achieve good financial performance while coping with environmental pressure [24]. The results of our study are consistent with the view that green learning orientation can improve sustainable performance by promoting green innovative behaviors. Green learning orientation encourages enterprises to enrich their green knowledge basis, which will facilitate green innovation behavior and then promote the sustainable development of manufacturing enterprises.

Third, CSR plays a crucial moderating role between green learning orientation, green innovation behavior, and sustainable performance. This study reveals how green learning orientation affects sustainable performance via green innovation behavior under the condition of CSR. The stronger the CSR, the greater the positive indirect effect of green learning orientation on sustainable performance via green innovation behavior, which aligns with the points mentioned by Le [52] and Torkkeli and Durst [53]. They suggested that environmental protection is a part of CSR, and CSR reflects organizational members' values and beliefs on environmental protection issues. Under the condition of high CSR, organizational members pay more attention to environmental issues [25], which improves enterprises' ability to acquire information and knowledge resources, promotes enterprises

to carry out green innovation to cope with environmental protection regulations, and ultimately improves enterprises' sustainable performance [52].

5.2. Theoretical Implications

This study provides theoretical contributions to green innovation and sustainable performance literature in three aspects. First, this study has enriched the organizational learning research in the sustainable development field. The impact of manufacturing enterprises on economic development and environmental protection is very important, so they need to be responsible for economic growth and environmental sustainability [10]. However, existing studies mainly focus on the ways that learning orientation contributes to improving business performance [17]. Few studies have explored the impact of green learning orientation on sustainable performance from the perspective of environmental management. Therefore, this study examines the impact of green learning orientation on sustainable performance from the perspective of organizational environmental management. These results enrich the literature on sustainable performance and reveal the mechanism by which green learning orientation promotes sustainable performance.

Second, this study reveals the theoretical "black box" between green learning orientation and sustainable performance. Although scholars have explored factors influencing sustainable performance, such as stakeholder integration [54], green supply-chain management [55], and green intellectual capital [31], there are few studies focused on the relationship between green learning orientation and sustainable performance. Previous studies have emphasized that organizational learning orientation affects innovation [40]. Enterprises can achieve better performance through innovation [56]. Therefore, this study emphasizes that enterprises with a strong green learning orientation can achieve better performance through green innovation behavior, which also verifies the viewpoints of Wang et al. [16] and Zhang et al. [2]. Specifically, green innovation behavior is crucial to converting green learning orientation into sustainable performance, and it plays a mediating role between green learning orientation and sustainable performance. To sum up, this study strengthens the understanding of sustainability and expands the knowledge base regarding organizational learning theory in the sustainable development field.

Third, this study constructed a moderated mediating model to examine the moderating effect of CSR in the indirect process of green learning orientation affecting sustainable performance through green innovation behavior. Previous studies suggested that organizational culture had impacts on business performance and innovative activity [57,58], but few studies explored the moderating effect of environmental management in facilitating the transformation from green learning orientation to sustainable performance through green innovation behavior. Consistent with some studies based on organizational culture perspective [57,58], CSR plays an important role in promoting green innovation and sustainable performance. Our study provides novel insights to the green innovation and sustainability literature by revealing the moderating effect of CSR in the context of manufacturing in China.

5.3. Managerial Implications

From the perspective of management practice, this paper provides some managerial implications. First, in order to strengthen the green innovation ability of enterprises to improve their sustainable performance, enterprises should actively promote the green-learning-orientation strategy. Companies can achieve sustainable performance by fostering common values through developing policies and designing incentives to enhance employees' green organizational commitment and encouraging employees to learn, share, create, and exploit green knowledge.

Second, given the mediating role of green innovation behavior in the relationship between green learning orientation and sustainable performance, enterprises that want to achieve sustainable performance by improving green learning orientation should promote green innovation behavior actively. This is because green innovation behavior can

effectively help enterprises exploit the acquired green knowledge to create new green products and processes, thus transforming green knowledge into sustainable performance. Enterprises should also make policies to encourage employees' green innovation behaviors, for example, encouraging employees to consider environmental management and clean production issues in the process of product innovation. These efforts will enhance their sustainable performance and help them cope with external pressures.

Finally, this study suggests that enterprises need to pay much attention to the role of organizational culture in innovation and performance improvement. With the increasingly serious environmental problems such as excessive carbon emissions, severe resource constraints, and serious environmental pollution, as well as the increasing attention to environmental protection and clean production problems, enterprises must create a good organizational atmosphere and emphasize the importance of CSR. A high-level CSR can improve employees' environmental protection awareness and enhance their green learning orientation, thus accelerating green innovation to improve sustainable performance. By strengthening the construction of CSR, enterprises can even reduce their resource investment in green learning and green innovation. In conclusion, CSR plays a crucial role in the relationship between green learning orientation and sustainable performance. This study provides novel management enlightenment and practical implications for sustainable development by revealing the effect of CSR.

6. Limitations and Future Research

This study has some limitations, but it also provides directions for future research. First, the data of this study are only obtained from some manufacturing enterprises in China, and these findings are not applicable to other contexts. Therefore, future research could generalize study design to other economies and other industries, and could compare differences among countries or industries. Second, it was not possible to reveal the causal relationship between the variables in this study, since a cross-sectional survey was used. Therefore, longitudinal studies can be used to verify the interplay between green learning orientation, green innovation behavior, CSR, and sustainable performance. Third, this study focuses on the mediating and moderating role of green innovation behavior and CSR, but there may be other factors influencing the relationship between green learning orientation and sustainable performance, such as green absorption capacity [59] or green supply-chain integration [60]. Therefore, future studies should further explore other boundary conditions to enrich the research on sustainable performance. Finally, given the difficulty and high cost of data acquisition, we adopted the convenient sampling method to acquire the data. However, the data acquired by this method were arbitrary and could not represent a clearly defined population, and the results should not be inferred from the population. Therefore, a random sampling method should be used in the future studies to improve the representativeness of samples and strengthen the reliability of the conclusions.

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Appendix A

Table A1. Measurement scales.

Constructs	Label	Measurement Items	Sources
SP	SP1	Our company will reduce the emissions of hazardous waste to comply with environmental regulations	Xie and Zhu (2020)
	SP2	Our company consumes very few resources, such as water, electricity, gas, and gasoline	
	SP3	Reducing energy consumption and material consumption helps our company achieve profit growth	
	SP4	Our company is always committed to providing better service and ethical guidelines to satisfy the requirements of the public and government	
GLO	GLO1	Our employees regard learning ability as an important factor in acquiring a corporate competitive advantage	Fong and Chang (2012); Sheng and Chien (2016)
	GLO2	Our employees understand the organizational goals and vision clearly and are willing to acquire and absorb new knowledge related to green production or operation	
	GLO3	The organizational structure of our company is conducive to green knowledge sharing and creation	
	GLO4	Top managers of our company encourage employees to create and share green knowledge	
GIB	GIB1	Our company often adopts the innovative concept of environmental protection in the product design	Longet et al. (2017)
	GIB2	Our company often explores new methods, techniques, or instruments to facilitate business development in the clean production processes	
	GIB3	Our company often recycles energy and reduces pollution emissions from end-of-pipe processes (e.g., wastewater, waste gas, and solid pollution)	
CSR	CSR1	Employees in our company have a strong degree of awareness of CSR	Yu and Choi (2016)
	CSR2	Our leaders believe in and value the adoption of CSR	
	CSR3	Our organization keeps a dedicated department or person for CSR management	
	CSR4	Our organization provides CSR training programs for the employees	
	CSR5	Our organization develops strategies for CSR activities	

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