RESEARCH ARTICLE

Going green: how do green supply chain management and green training influence firm performance? Evidence from a developing country

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Abstract

Using the natural resource-based view theory, we investigated the relationship between green supply chain management, green training, green organizational culture, and firm performance. Using a survey questionnaire, we obtained data from 650 respondents from the Chinese manufacturing sector. Structural equation modeling (SEM) was used to test the hypotheses in this research. The study's findings indicate that green supply chain management positively influences firm performance. The findings also showed that green training mediates the relationship between green supply chain management and firm performance. Our study's results generally support all direct and indirect impact hypotheses and have several theoretical and practical consequences. Moreover, the findings showed that green organizational culture positively moderates the relationship between green training and firm performance. Furthermore, this study gives vital information to managers and legislators of the manufacturing sector while assessing firm performance. It may assist the senior management in strengthening their internal strategy to optimize their influence on environmental sustainability.

Keywords Green supply chain management · Green training · Natural resource-based view theory · Green organizational culture · Firm performance

Introduction

As a result of recent environmental catastrophes such as increased fossil fuel usage, energy shortages, and wildfires, governments worldwide are very worried about climate change (Wu 2021). Due to the rising proportion of CO_2 emissions, the severity of polluted air has grown. Polluted air is believed to be the most damaging pollution because it travels swiftly over long areas and creates ecological harm everywhere (Wu et al. 2020). For environmental sustainability, the manufacturing industry exerts significant effort to achieve congruence between financial and environmental standards (Nureen et al. 2023), leading to a win–win situation (He et al. 2022). Furthermore, society and customers behave more ethically when they consider the environmental actions of businesses before making purchases (Rauf et al. 2023). As a response, industrial firms across the globe, particularly in developing countries, have adopted several pro-environment initiatives (Ren et al. 2021).

Aspects of green supply chain management (GSCM) are the administrative activities performed by firms to minimize energy consumption (Hao et al. 2022) and pollution in order to promote sustainability over time. These actions will result in acquiring a competitive advantage (Nureen et al. 2022). Developing countries have recently used GSCM to balance environmental protection and economic growth (Yu et al. 2019). It is essential to recognize that successful GSCM implementation depends on a mix of strategies (Yang et al. 2022). GSCM activities, such as sustainable design,

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recycling, and sustainable production, are the most important and widespread GSCM approaches (Khan et al. 2021c). By using these factors, it is feasible to achieve the objective of becoming green; nevertheless, companies should prioritize GSCM, a more financially viable and environmentally responsible technique (Khan et al. 2019), in their efforts to become more environmentally responsible (Jermsittiparsert et al. 2019b). GSCM enhances the standard notion of supply chain management from a more environmentally friendly supply chain management standpoint by improving the firm performance (FPR) of products and services across their full life cycles (Du et al. 2022). In the context of the search for resilience in supply chain operations, the implementation of GSCM faces various hurdles, including inadequate financial resources to allow recycling (Shou et al. 2020). Other potential hurdles were a lack of trust among supply chain actors and insufficient commitment from the top management (Khan et al. 2021a). Even though this topic has been discussed over the last decade, its implementation remains difficult owing to the obstacles above, especially in emerging economies (Khan et al. 2021b).

Green training (GTR), a technique of on-the-job continuous education and training designed to meet a firm's green goals and objectives, has attracted considerable interest among "green" HRM practices (Pinzone et al. 2019). Earlier inquiries have yielded two contradictory opinions, especially regarding the employee's perspective. GTR has been identified as vital to address in order to promote the adoption of green workplace practices since it produces positive effects for both businesses and employees (e.g., the implementation of quality standards and the growth of environmentally friendly effectiveness) (e.g., personal acknowledgment to encourage green behaviors) (Gull and Idrees 2022). In addition, many studies have emphasized the likelihood of a "trade-off" between GTR's social and environmental outcomes. In addition, the current study on GTR demonstrates that it may adversely affect employees by increasing job pressure, time pressure, and stress, diminishing the organization's internal social sustainability (Xie and Zhu 2020). Consequently, despite the informative insights on GTR from past research, there are two substantial knowledge gaps. Nonetheless, human resource management is crucial for the success of an environmental stewardship strategy. Consequently, some scholars have voiced concern regarding the term "environmental protection." According to Roscoe et al. (2019), developing a green organizational culture (GOC) and getting GTR are essential to green practices when developing ecological sustainability strategies. According to a study of the prior studies, GOC has not received significant consideration.

Most studies have focused on highlighting the link under the following areas. Numerous types of research have

established a connection between GSCM and FPR, but since this association is vague, academics continue to study it. Furthermore, many scholars suggested using moderators or mediators between the GSCM and the FPR (Hashmi and Akram 2021). GTR study has also focused on the health sector, environmental qualities, and workforce happiness, among others (Sinaga and Nawangsari 2019). Although the influence of GTR on manufacturing firms' activities and outcomes is critical for enhancing FPR and environmental behavior, so further exploration is required in this concern. Few research studies relate GTR to organizational and environmental outcomes, particularly in the manufacturing sector in developed countries (Alola et al. 2022). In addition, comparative research on the manufacturing sector in developing countries related to GTR, an essential component of GSCM for higher FPR, is scarce. Several scholarly articles examine how manufacturing organizations might enhance FPR using GTR (Wu and Greig 2022). This study explores the effect of GSCM on FPR in developing countries by mediating the influence of GTR and moderating the influence of GOC.

The following are the key contributions of the study: first, unlike the previous research, this study examines the factors that potentially influence FPR. Although this is the first research undertaken from a developing country's viewpoint, no other studies have been conducted under such a novel framework. The link between FPR, GTR, GSCM, and GOC has not been well studied. The natural resource-based perspective (RBV) theory highlighted these components as crucial to comprehend the firm's continuous progress through its effective FPR; therefore, this study utilized this theory to test the provided hypotheses (Hart 1995). When evaluating FPR, the researchers gave GTR and GOC minor consideration. In this paper, these research gaps are filled. This study investigates in depth the relationship between GSCM and FPR with the mediating effect of GTR and the moderating effect of GOC, based on the natural resource-based perspective theory, the existing components, and the proposed new features, which were overlooked by previous research. The study's primary aims are (i) to examine the relationship between GSCM and FPR, (ii) to determine if GTR mediates the link between GSCM and FPR, and (iii) determine whether the GOC moderates the relationship between the GTR and FPR.

The following portions of the study are organized: in the second section, a literature review and the formulation of hypotheses are covered. In the third section, the methodology and research design are explained. In the fourth section, results and analysis are discussed. "Discussion" describes the study results and their policy implications, recognition of research limitations, and recommendations for further research.

Theoretical background and development of hypotheses

Natural resource-based view theory

The natural RBV hypothesis posits that an organization's resources and competencies are essential to attaining a competitive edge (Barney 2000). The natural RBV theory, an enhanced version of the RBV theory, proposes that firms may achieve a long-term competitive advantage by considering ecological problems (Hart 1995). Hart (1995) argues that the RBV hypothesis has significant flaws. It excludes the relationship between a company's physical surroundings and the company itself. Before now, this disregard was acceptable, but it is now evident that the natural environment is essential to attaining a competitive edge. Reducing pollution, capabilities, and natural resources enhances the profitability of businesses (Hart and Dowell 2011). The RBV contends that differences in FPR may be caused by resources that are monetarily valuable, scarce, difficult to replicate, and poorly transferable between enterprises. RBV is consistently employed as the foundation for marketing strategy research due to the relationship between the allocation of resources and performance (Hart and Dowell 2011). It is appropriate for studies focusing on sustainability and green practices. Competitiveness is related to value and scarce resources, and that competitiveness is related to FPR. Resources come in both basic and superior forms. Resources with a greater relative value are grouped together as vital resources. They are made up of core materials, both tangible and intangible, that work together to help enterprises achieve their goals. They are frequently referred to as talents or competencies (Hart 1995).

By noting that businesses that typically correspond to a certain set of resources may have trouble obtaining other resources or talents, the definition of RBV expanded. By creating new resources, businesses must be able to adapt to changing environmental consequences. According to Hart, the limitations and challenges posed by the natural (biophysical) environment will be one of the most important factors influencing the development of creative resources and entrepreneurial competence. As a result, the company's NRBV is a revision of its RBV that was forced by environmental requirements. In addition, they found that organizational skills, natural factors, and tactics for avoiding contamination led to long-term success. Academics may utilize the natural RBV theory to study company success by concentrating on the financial, environmental, and social elements of FPR (Sodhi 2015). In this research, the authors intended to quantify FPR utilizing GTR, GSCM, and GOC in conjunction with the natural RBV theory.

Development of hypotheses

Green supply chain management and firm performance

The phrase "green supply chain management" (GSCM) refers to the inclusion of environmental issues throughout the SCM process, including sustainable product design, sourcing of material and choice, manufacture, distribution, and recycling (Uddin 2021). In this study, the researchers define GSCM as a set of activities that might lower an organization's environmental impact while creating a final product. In this regard, the company refers to manufacturing firms, which are a potential cause of environmental problems. The researcher's investigation of GSCM techniques focuses on sustainable product design, sustainable manufacturing, and recycling. Recyclable, reusable, and remanufacturing items are collected from customers or returned by consumers to maintain the firm's efficiency and retain natural sustainability benefits. Utilizing rapid, reliable, and potent industrial technology, sustainable production reduces waste and boosts development. It involves employing environmentally friendly inputs in industrial processes that are highly efficient, create little to no waste, and have little impact on the environment (Thongrawd et al. 2019). Jermsittiparsert et al. (2019a) aimed to achieve low input, high output, and little environmental impact by linking sustainable manufacturing to cleaner production techniques, modern technology, and greatly reduced basic materials and resources (Irfan et al. 2021).

ISO 14001 defines an FPR as the measurable outputs of sustainable practices relating to the management of environmental concerns implemented by the organization in accordance with its environmental goals and policies. Reducing environmental toxins is the primary objective (Li et al. 2020). A company may enhance its FPR by reducing air emissions, wastewater production, solid waste production, the use of hazardous compounds, and ecological catastrophes. Providing general managers with environmental duties and training both non-environmental workers and environmental specialists may, among other things, enhance FPR (Singh et al. 2019). Fianko et al. (2021) argued that several firms have effectively combined environmental concerns with financial success, as was found. In addition, GSCM enhances FPR by lowering the environmental impact of industrial processes and through increased market share, which leads to competitiveness. From the above discussion, we derived the following hypothesis:

H1: GSCM practices significantly influence the FPR.

Green supply chain management, green training, and firm performance

According to Roh et al. (2022), in an effort to be more environmentally friendly, firms can prioritize GSCM practices, which are both economically and ecologically superior. By boosting the efficiency of products and services over their full life cycles, GSCM enhances the standard concept of SCM to include a more environmentally friendly approach to process optimization. In light of the need to optimize the whole supply chain of businesses, implementing GSCM faces various hurdles, such as inadequate money to support recycling (Gelmez 2020). Other potential hurdles include a lack of confidence among supply chain partners and a deficiency of senior management commitment (Ikram et al. 2019). The integration of top management and environmental management may help firms overcome challenges to adopting green initiatives in accordance with the resource-based perspective of GSCM. This is because GHRM, defined as the alignment between traditional human resource operations and ecological goals and policies (such as GTR and performance evaluations), may enhance employee motivation in sustainable FPR (Naderifar et al. 2022). We highlighted GTR as one of the GHRM strategies that might potentially help GSCM. GTR is a technique of on-the-job training and continuous education to achieve an organization's environmental management goals and objectives. GTR is a kind of environmental training that enables all personnel (upper, senior, and intermediate administrators, as well as employees) to integrate the performance of a company with environmental concerns (Yong et al. 2020). According to Chaudhary (2019), GTR has a strong association with the evolution of environmental management in enterprises. In light of the aforementioned considerations, we formulated the following hypotheses:

H2: GSCM and GTR have a positive relationship.
H3: GTR has a significant impact on the FPR.

The mediating role of green training

GTR refers to a system of continuing education and training at the workplace to achieve environmental requirements. GTR is one of the most often utilized GHRM dimensions and is also acknowledged as essential for effective FPR, greener manufacturing, and GSCM (Cop et al. 2020). According to ISO 14001, the objective of GTR is to "ensure that personnel at all organizational levels understand the objectives of the firm and how their job-related actions affect environmental standards and the achievement of firm's objectives, thereby enhancing staff members' ability to identify environmental threats, comprehend them, and take appropriate action to address them" (Pham et al. 2020). Additionally, Jia et al.

(2018) discuss the necessity of GTR in the workplace in order for employees to adjust their behavior and become more accountable for sustainable standards. Empirically, According to Singh et al. (2019), green competence is developed by GTR approaches, motivating employees to "go the extra mile" for the environment and demonstrate greener work behavior willingly. Consequently, it is projected that the GTR program would substantially enhance the FPR.

Since it enhances FPR and competitiveness, GTR for employees has grown in popularity and significance. However, the topic is still in its infancy, demanding more research. In increasing demand from various stakeholders, it is necessary to neutralize possible obstacles using emotional core abilities. Worker GTR has grown into a vital instrument for controlling this pressure, which impacts the FPR and market competitiveness of the firm (Singh et al. 2019). Personnel management and development have been crucial aspects of the FPR objective. It is believed that adopting GTR would improve the working environment for employees and the area, where inhabitants may lead better lifestyles (El-Kassar and Singh 2019). According to Khan et al. (2020), implementing environmentally conscious and less polluting industrial processes has a positive effect on both the cultural implications of the workforce and mankind. Organizations may achieve several societal goals, including consumer protection, market liberalization, and nature conservation. Consequently, firms that include GSCM in their everyday operations may increase FPR. GTR plays a crucial role in disseminating environmental attitudes and requirements by encouraging the appointment of qualified employees committed to adopting green beliefs and principles based on GSCM growth (Darwish et al. 2021). According to Guerci et al. (2016), GTR links GSCM practices and FPR interactions. Adopting the natural RBV theoretical viewpoint permits a more systematic study of the link between GSCM activities, GTR, and FPR by outlining the connection between these eco-friendly behaviors and sustainable outcomes. The following hypothesis was developed in light of the above arguments.

H4: The link between GSCM and the FPR is significantly mediated by GTR.

Green organizational culture as a moderator

According to Blumberg and Pringle (1982), enhancing employees' talents and activities allows them to collaborate with management. This involves enhancing employee talents that, to some part, depend on the workplace perspective in contexts such as supportive companies or the GOC. According to Al-Swidi et al. (2021), although employees possess the requisite GTR and knowledge to do the duties required by the businesses, management assistance or opportunities

for them to engage in jobs that would limit their opportunities and decrease their motivation are limited. If employees get the required GTR and education, their motivation to participate in environmental activities will rise in a greener environment. This increase will enhance after the organization creates green options for employees to include green efforts in the workplace through a GOC. Empirically, according to Hayton et al. (2012), when a business makes a greater effort to cultivate a GOC, GTR is necessary to increase the influence on workers' green behavior (Fig. 1) . Typically, firms have a GOC, enabling employees to engage in green projects and get the necessary knowledge and skills. This encourages employees to participate in greener activities, especially those with higher environmental criteria, on their initiative (Green et al. 2007). Therefore, we argue that firms should place a greater emphasis on developing a GOC since it bolsters the influence of GTR on FPR compared to organizations with a weak GOC. Consequently, we propose the following hypothesis:

H5: The GOC significantly moderates the relationship between GTR and the FPR.

Methodology

Sampling and development of the questionnaire

According to Toledo-Pereyra (2012), if the objective of the study is to extrapolate the population's features, opinions, or behavior from a sample, a quantitative approach should be used. Since our study aims to analyze the moderating effect of GOC on GTR and the FPR and the mediating influence of GTR on the relationship between GSCM and the FPR in developing countries' manufacturing sectors, this methodology is suitable. A survey was utilized to gather quantitative data and examine the correlations between variables in accordance with the design of the

research (Irfan et al. 2022). As for the participants, we recruited employees of Chinese manufacturing enterprises that participated in environmental measures. Environmental concerns have gained prominence, particularly in China's manufacturing industry, where GSCM techniques with an emphasis on sustainability are used. The participants must have at least one year of professional experience. They are required to understand green workplace activities and environmental regulations. Our target market is the manufacturing industry, which includes furniture, information, electronics, autos, etc. Employees from the manufacturing industry supplied information on several GSCM and GTR business, FPR, and government-related elements. We protected the secrecy of the questionnaire to reduce the possibility of common method variance (CMV).

Further than the sector and size of the organization, respondents may choose not to give more personal and organizational data to minimize the impact of the common rater. Data was gathered using various technological methods between December 2022 and February 2023. By giving the link for online survey questions, questionnaires were circulated. To increase the response rate, we first sent a survey to 700 participants and then those respondents shared the questionnaire with their contacts. Male participants comprised 59% of the 650 complete responses, while females comprised 41%. Most responders (66%) held managerial positions, giving them relevant insights about their company's policies and practices. The entire demographic findings are shown in Table 1.

The ten items for the GSCM were obtained by (Purwanto et al. 2022). The six-item measure was used in the study to evaluate GOC (Bae and Grant 2018). Six elements from the research of (Rizzi et al. 2022) were selected for the evaluation of GTR. We evaluated the FPR using a five-item test created by (Adebayo et al. 2020). A five-point Likert scale was used in the present study to evaluate all qualities, with one denoting "not at all" and five denoting "completely."
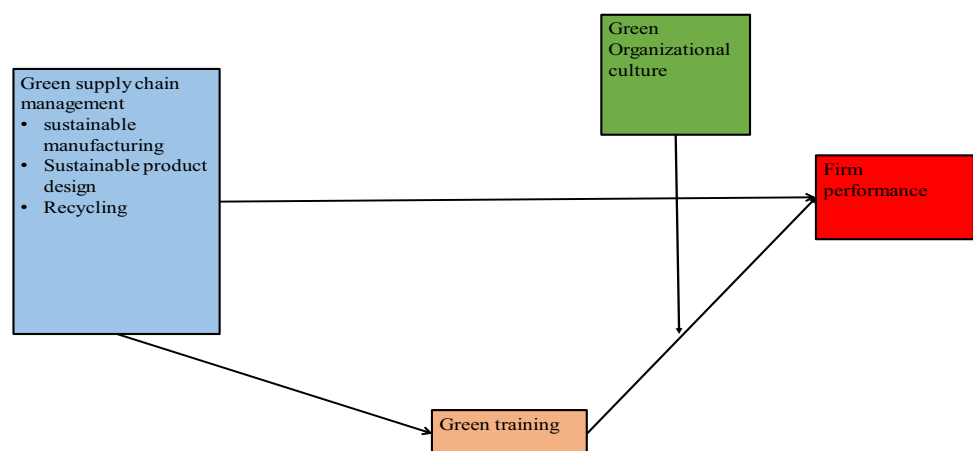
Fig. 1 Conceptual framework

Table 1 Demographics of respondents

Features	Options	Frequencies	(%)
Age	20–30	210	32.30
	30–50	260	40.00
	Above 50	180	27.69
Gender	Male	384	59.43
	Female	266	40.92
Income (CNY)	<2000	49	7.53
	3000–6000	120	18.46
	7000–10,000	200	30.76
	11,000–15,000	140	21.87
	16,000–20,000	95	14.61
	>20,000	46	7.07
Education	Primary	110	16.92
	High school	165	25.38
	College degree	205	31.53
	Graduate	170	26.15
Experience	Less than 5 years	200	30.76
	5–10 years	190	29.23
	More than 10 years	260	40

Questionnaires with incomplete information are excluded

Data analysis

Version 3.2.3 of the SmartPLS software is used for statistical analysis. Using structural equation modeling (SEM), the proposed hypotheses are examined. SEM is a practical methodology that yields reliable and useful results when analyzing the relationship between varied factors (Steenkamp and Baumgartner 2000) and has three significant benefits over older techniques: (i) an accurate estimate of measurement inaccuracy, (ii) estimating latent variables based on observable data, and (iii) model validation employed to assess and implement a sequence based on data conformance (Novikova et al. 2013). In addition, the majority of multivariate methods implicitly overlook computational mistakes. The SEM investigates independent and dependent structures through calculation mistakes (Sardeshmukh and Vandenberg 2017). Due to its reliability and sturdiness, the method yields precise and distinguishable results (Belaïd 2017).

The SEM approach produces accurate data and enables the creation of distinctive indicator designs for every element (Ahmad et al. 2021). The incorrect portions of the studied variables are also assessed. As a result, the relationship between the variables yields reliable results. Additionally, it can examine complex interconnections and a variety of hypotheses that other systems and prototypes cannot by incorporating mean configurations and group assessments (Al-Gahtani 2016). Given the benefits of SEM, we employed it in this research due to its potency in determining the correlation among all variables under investigation.

Analysis and results

Confirmatory factor analysis (CFA)

Confirmatory factor analysis (CFA) is used to assess the validity and reliability of the framework, which includes all item scales. The standardized root mean square residual (SRMR), normed fit index (NFI), and chi-square (X^2) values indicate that the CFA model fits the data (Irfan et al. 2021). As a result, we recognize and acknowledge each indication's contribution to the created variable (see Table 3). After that, the Cronbach alpha (α) values are acceptable since they are more than the cutoff of 0.70. The findings supported the measuring constructs' good convergent validity and reliability. They are evaluated along with average variance extracted (AVEs) and composite reliability (CR). The AVEs and CRs in earlier investigations attained the suggested threshold value of 0.50. The value of AVE from each latent notion must be greater than the square correlation among each set of components to demonstrate discriminant validity (see Table 2).

Common method variance

This study's cross-sectional approach may have resulted in certain cases of common method bias (CMB). Using Harman's single-factor test (extraction method = principal axis factoring), this research looked at CMB. According to the fundamental principles (Podsakoff et al. 2012), CMB modifies the findings when one component accounts for greater

Table 2 Discriminant validity

S. no	Variables	CR	AVE	FPR	GOC	GSCM	GTR
1	FPR	0.917	0.689	0.830			
2	GOC	0.872	0.532	0.779	0.729		
3	GSCM	0.937	0.597	0.851	0.709	0.773	
4	GTR	0.922	0.664	0.838	0.780	0.833	0.815

$N = 650$; *CR*, composite reliability; *AVE*, average variance extracted; *FPR*, firm performance; *GOC*, green organizational culture; *GSCM*, green supply chain management; *GTR*, green training

Table 3 Factor loadings and results of reliability analysis

Variables	Items	Standard loadings	Cronbach-α
Firm performance			0.886
	FPR1	0.906	
	FPR2	0.826	
	FPR3	0.833	
	FPR4	0.830	
	FPR5	0.746	
Green organizational culture			0.831
	GOC1	0.690	
	GOC2	0.666	
	GOC3	0.715	
	GOC4	0.758	
	GOC5	0.789	
	GOC6	0.749	
Green supply chain management			0.925
	GSCM1	0.775	
	GSCM2	0.826	
	GSCM3	0.827	
	GSCM4	0.780	
	GSCM5	0.720	
	GSCM6	0.691	
	GSCM7	0.804	
	GSCM8	0.816	
	GSCM9	0.764	
	GSCM10	0.710	
Green training			0.899
	GTR1	0.772	
	GTR2	0.844	
	GTR3	0.795	
	GTR4	0.802	
	GTR5	0.835	
	GTR6	0.839	

than 50% of the total variation. A single component's greatest effect was 34.50%, which is less than the 50% threshold limit. These results suggest that the data do not include any CMB. Additionally, we used a specific methodology to research the CMB (Kock 2015). According to this approach, a VIF variation greater than 3.30 confirms the presence of CMB. However, this study's results show that the VIF factor level is under the required cutoff value of 3. Based on the above evidence, CMB is not an issue in this study model Table 3.

Hypotheses result and structural model

We examined the model's connections using SEM and covariance-based curve evaluation approaches. The study's high f-value suggests that all relationships are linear. In addition, many fitness tests were undertaken to ensure that the data matched the structural framework. All fit index values (i.e., NFI = 0.945, RMSEA = 0.032, and SRMR = 0.033) are within the acceptable range, showing that the structural model fully accounted for this study's data (Lucianetti et al. 2018).

Figure 2 depicts the schematic depiction of SEM together with structural pathways. The path coefficient of the constructs shows that GSCM considerably influences the FPR ($\beta = 0.435$, $p = 0.001$). Therefore, we accepted H1. In contrast, GSCM positively impacts GTR ($\beta = 0.833$, $p = 0.000$), and GTR significantly influences FPR ($\beta = 0.220$, $p = 0.000$). Accordingly, we accepted H2 and H3. Similarly, the mediated effect of GTR on the relationship between GSCM and FPR was determined. Based on estimations, GTR ($\beta = 0.184$, $p = 0.001$) mediates the link between GSCM and FPR. In addition, the moderating effect of GOC on the relationship between GTR and FPR was calculated. GOC ($\beta = 0.075$, $p = 0.025$) was shown to moderate the association between GTR and FPR. Thus, H5 is acceptable. Table 4 depicts

Fig. 2 Path diagram of structural equation modeling. ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$. Source: Authors' calculation
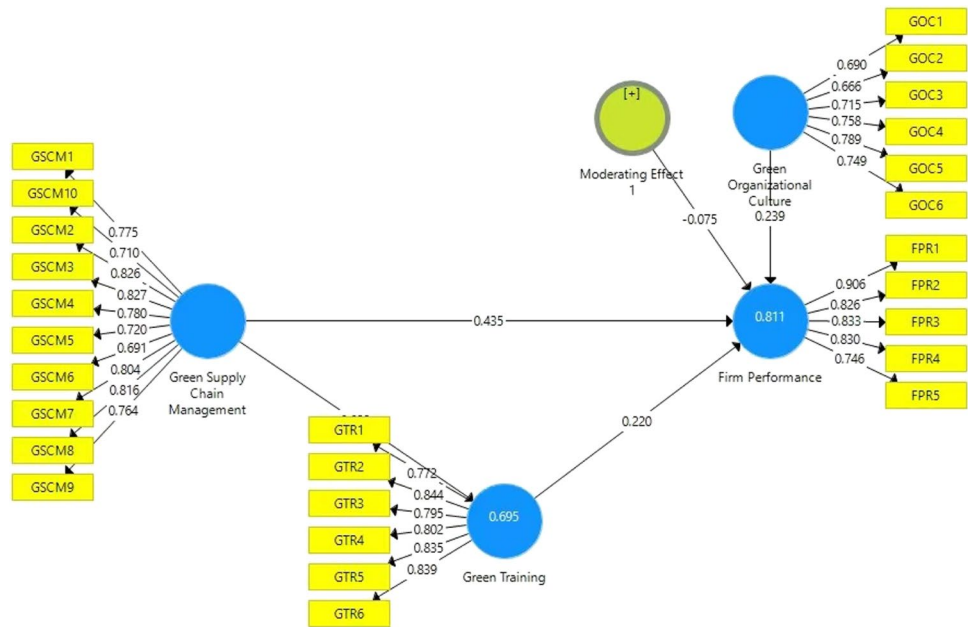

Table 4 Results of hypotheses

Hypotheses	Beta	S.E	*t* value	*p* value	Decision
H1: Green supply chain management—> firm performance	0.435	0.059	7.321	0.001	Supported
H2: Green supply chain management—> green training	0.833	0.026	31.451	0.000	Supported
H3: Green training—> firm performance	0.220	0.068	3.224	0.000	Supported
H4: Green supply chain management—> green training—> firm performance	0.184	0.057	3.215	0.001	Supported
H5: Green organizational culture × green training—> firm performance	-0.075	0.024	3.176	0.025	Supported

suggested pathways and the validity of the hypothesis (see Fig. 2).

Predictive relevance (Q2)

In this study, the Stone and Geisser test is conducted using blindfolds to assess the predictive validity of this research framework. Leguina (2015) demonstrated that a framework has predictive importance if the values of Q2 for all endogenous constructs in the path model are larger than zero (> 0), which is how this technique is anticipated. All of our framework's endogenous components are given in Table 5, and their values of Q2 are larger than 0 (see Table 5).

Discussion

Companies must pursue competitiveness via pollution reduction initiatives, greater manufacturing awareness, and sustainable development based on the natural RBV paradigm (Hart 1995). To bolster this perspective, we evaluated the importance of GOC in assisting a business in increasing its

Table 5 Blindfolding statistics for the general model

Construct	SSO	SSE	Q^2 (= 1-SSE/SSO)
Firm performance	1120	505.02	0.549
Green organizational culture	1344	815.10	0.394
Green supply chain management	2240	1852.00	0.173
Green training	1344	730.53	0.456

FPR. Additionally, studies have shown that GOC promotes FPR and that the link between GSCM and FPR may be mediated by a number of factors (Imran et al. 2021). According to past studies, GOC's effect might be a decrease in CO_2 emissions and the maintenance of healthy ecosystems, hence enhancing FPR (Aggarwal and Agarwala 2021). This research suggests that GOC may raise FPR while moderating the association between GTR and FPR.

This research examines how GTR affects employees' behavior regarding their direct interactions with the GSCM and FPR. The study's predicted association was investigated

using the natural RBV theory as its theoretical foundation. The results show that GRT has a favorable effect on GSCM and the FPR. Additionally, GOC significantly moderates the relationship between GTR and the FPR. It was also discovered that GSCM significantly improved the FPR through GTR. According to Pham et al. (2018), GTR contributes significantly to the firm's greening and is a source of competitiveness. Manufacturing sectors should strongly emphasize educating staff members about the value of greener for the climate and people in general.

Theoretical implications

This research offers three significant theoretical advancements. First, the research's results broaden the natural RBV theory on how GSCM, GTR, GOC, and FPR are related. The results of this research support the natural RBV theory that FPR depends on GSCM practices, GTR, and GOC (Singh and El-Kassar 2019). This research demonstrates how firms can significantly improve performance directly and indirectly through GSCM, GTR, and GOC (Alola et al. 2022). Second, this research advances our understanding of environmental management. To gain advantages in the form of improved FPR and competitiveness, we propose that firms establish and execute ecological ethical codes of conduct across various organizational processes and systems. Our research indicates that strengthening GSCM practices to decrease adverse effects of their business operations, if there are any, on the constructed and tangible environment within the framework of environmental protection, even though we acknowledge that FPR is enhanced due to the adoption of GTR and GOC at the workplace. Lastly, our work increases theoretical knowledge of the relationship between GTR and the effectiveness of FPR endeavors, as shown by several studies (Teixeira et al. 2016). The goal of GTR is to harmonize various HRM methods with the FPR (Pham et al. 2018). According to this research, GSCM, GTR, and GOC are important for an organization's efforts to minimize pollution, enhance the quality of its goods and services, reduce average operational costs, and enhance its public image. So, according to our research, GTR, GSCM, and GOC improve FPR objectives, which impacts competitiveness. Therefore, we propose that GTR acts as a source of route dependency to improve FPR and competitive advantage and focuses on strengthening employees' environmental competencies (Pinzone et al. 2019).

Managerial implications

This research has numerous significant management ramifications since key stakeholders cannot afford to disregard the growing environmental demands. First, businesses have been subjected to greater demand from stakeholders to develop ecologically sustainable practices to lessen the detrimental effects of business on natural environments (Yusoff et al. 2020). According to this research, senior management and staff members in such a business climate should be dedicated to implementing and maintaining environmentally sustainable standards to improve the FPR. This research also shows that GTR and GOC are more important elements for employees' greener job behaviors concerning sustainable green initiatives grounded in environmental protection. It not only improves the FPR but also positively impacts competitiveness over competitors in the marketplaces. Moreover, this research shows that firms should proactively approach rather than reactive to ecologically sustainable practices at work to foster and maintain synergy among the triangle of profitability, humanity, and the environment. The results of our study thus urge organizations to devote a sizeable portion of their annual budgets and other pertinent resources to GTR with the explicit aim of developing workers' ecologic behaviors for improving and maintaining the FPR. We recommend that such employees undergo ongoing GTR to meet their most important stakeholders and outperform competitors in competitive marketplaces. Furthermore, we encourage companies to improve their GOC to ensure long-term sustainable practices at the workplace. These strategies should be in line with the firm's environmental goal. We argue that the harmonious coexistence of the GSCM practices, GTR, and GOC stated above under the aegis of the FPR would ensure that firms, humanity, and the earth always survive and remain healthy and flourishing.

Limitations and direction for future research

The current research showed numerous important limitations despite its major contributions. Firstly, GOC was a moderator in this research between GTR and the FPR. Hence, the organizational strategy should be included as an additional factor in future studies. Second, GSCM practices vary among businesses, industries, and nations. As a result, GSCM practices differ among nations, industries, sectors, and developing and industrialized economies. Because the study was limited to the manufacturing industry in one specific developing country (China), the generalizability of the findings is constrained. The third area of the research focused on GTR's role as a mediator between GSCM and FPR. To significantly advance the GSCM and FPR literature, future studies should examine the mediating role of pro-environmental behavior. Fourth, information was exclusively acquired from the manufacturing industry. Future research should thus focus on various sectors, including those that are more cutting-edge in solving environmental issues, like the technology sector.

Author contribution N. Nureen: conceptualization, writing-original draft, and methodology. Y. Xin: supervision and funding acquisition. M. Irfan: formal analysis, data handling, and methodology. S. Fahad: writing—review and editing, and variable construction.

Data availability All data generated or analyzed during this study are included in this article.

Declarations

Ethics approval and consent to participate This research study was conducted according to the Declaration of Helsinki guidelines. The Institutional Review Board of North China Electric Power University has approved the study (protocol code 19005–6 on 17 August 2022).

Consent for publication Informed consent was obtained from all respondents belonging to this research study.

Competing interests The authors declare no competing interests.

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