

# Top Management Characteristics, Green Supply Chain Management and Corporate Performance —Moderating Effects of Competition Intensity

Lu Liu

School of Management, Jinan University, Guangzhou, China

Email: liulu829475@163.com

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## Abstract

Based on high-order theory and green supply chain management theory, this paper takes 251 manufacturing enterprises in China, the United States and Vietnam as samples to study the impact of corporate Top Management Characteristic on green supply chain management, and green supply chain management and enterprises, and then introduces competition intensity to explore whether it plays a moderating role in the relationship between GSCM and firm performance. The results show that the age, education level and tenure of executives significantly positively affect green supply chain management practices; green supply chain management practices have a positive impact on corporate environmental performance; while green supply chain management practices cannot directly improve economic performance. However, it can promote economic performance by improving environmental performance; competition intensity plays a positive role in the relationship between green supply chain management practices and economic performance.

## Keywords

Top Management Characteristic, Green Supply Chain Management, Firm Performance, Competition Intensity

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## 1. Introduction

As a pillar industry of the national economy, manufacturing has created enormous material wealth for human society, but also brought a series of environmental and resource problems. In recent years, in order to cope with global problems such as environmental degradation and resource depletion, governments have adhered to the idea of sustainable development, and have succes-

sively introduced relevant laws and regulations and environmental protection policies, requiring enterprises to carry out green production activities.

However, the reality is that the level of green supply chain management practices of enterprises is still not high. Research shows that corporate attitudes are important for green supply chain management to be adopted. Cao (2007) [1] believes that in the implementation of GSCM, top manager's awareness of social responsibility and enterprise employee's awareness of environmental protection can directly promote the implementation of GSCM. Li (2013) [2] believes that top management's support, as an important driving force for the implementation of environment-related activities, is one of the key factors to promote the success of green supply chain practices in enterprises. The top management of the company has a specific role in fulfilling environmental responsibility and fulfilling the practice of green supply chain management. Because they are at the center of government, business, community, consumer and other stakeholders, how to meet the requirements of stakeholders and fulfill green supply chain management depends largely on the level of knowledge and values of senior managers. What kinds of characteristics do senior managers support green supply chain management practices? Since Hambrick *et al.* (1984) [3] scholars have suggested higher-order theory, Xiao (2017) [4] launched many studies on the impact of corporate strategic decisions regarding demographic characteristics executives, as well as Pan Ailing, Ming (2015) [5] Research on the impact of research on organizational performance.

In addition, in the construction of sustainable advantages of enterprises, there are three theoretical schools of explanations: exogenous view, endogenous view and comprehensive view. In the existing research, some scholars have explored whether GSCM can regulate the relationship between GSCM practice and firm performance, but few scholars have studied the moderating effects of them. The contingency theory, one of the exogenous theories, points out that the operation and decision-making of an enterprise will depend on the contingency factors of the external environment, the decision-making behavior and firm performance will be affected by the external environment. From the perspective of strategic analysis, competitors are one of the most important market participants influencing enterprises to make strategic choices. Competition intensity, as one of the important manifestations of the uncertainty of external environment, affects enterprises to adopt and implement GSCM and the results achieved after implementing GSCM. Therefore, the relationship between GSCM and firm performance is likely to be affected by the adjustment of competition intensity. How to make enterprises adapt to the current external competitive environment, coordinate the development of GSCM and enterprise performance, and make enterprises more proactive in the implementation of GSCM, is a hot topic of current research.

This paper starts with green supply chain management and discusses how top management characteristics (TMC) affect GSCM. Top managers' cognitive ability and values have a profound impact on the practice of GSCM. However, there

is a lack of research on the relationship between managers and green supply chain management, especially on the impact of top managers' characteristics on green supply chain management. Applying high-order theory to green supply chain management provides a new perspective for the research of green supply chain management. Taking top managers as the research object is an extension of the research field of green supply chain management, which is conducive to enriching and improving GSCM theory. Secondly, the relationship between GSCM and corporate performance is studied. Existing research has explored the relationship between GSCM and firm performance, and introduced internal variables such as resource commitment variables to explain the inconsistency between green supply chain management and firm performance from the endogenous view. However, few scholars have explained the relationship between green supply chain management and performance from an exogenous perspective such as the external market environment of enterprises. This paper introduces competition intensity as a moderator variable to examine the relationship between GSCM practice and firm performance, which deepens the relationship between GSCM practice and firm performance to a certain extent, and helps to clarify the boundary between the establishment of the relationship between GSCM practice and firm performance.

## **2. Research Theory and Hypothesis**

### **2.1. Top Management Characteristics (TMC) and GSCM**

Hambrick & Mason's high-order theory presupposes the limited rationality of human beings, and believes that the process of the cognitive foundation, values, insights and other characteristics of senior management members can influence the strategic choices and corporate performance of enterprises. Because the cognitive traits, values and other psychological traits are not easy to measure, the high-order theory draws on the research results of the team's demographic characteristics, and the demographic characteristics of senior management, such as age, position, work experience, education level., social status and economic situation, as the expression of the cognitive model of decision makers in the enterprise, to predict these characteristics will affect the implementation of the strategy and corporate performance. Among them, in terms of gender, with economic development and concept renewal, women play an increasingly important role in corporate governance and play an important role. Burgess, Tharenou (2012) [6] proposed that women tend to show enthusiasm, friendship, and caring for others. Therefore, they are more inclined to think about ethical issues and pay more attention to the fulfillment of corporate social responsibility. In terms of age, Dushnitsky & Lenox (2015) [7] believe that as managers age, they are reluctant to challenge new things, tolerance for new projects will decline, and more formal and more routine decisions will be made. The possibility of an enterprise engaging in illegal conduct is more likely to comply with laws and regulations to perform its duties. In terms of education level, the level of education of

executives has an impact on their ability development. The higher the level of education, the stronger its speculative ability and the more objective and rational the decision-making is. Faced with a complex and diversified business environment, we can more comprehensively consider and develop a strategy that is conducive to the long-term development of the company, because we believe that the higher the education level of the executives, the more likely they are to actively implement green supply chain management. In terms of executives' term, the longer the executives perform their duties, the more loyal they are to the organization, and the more they tend to make decisions from the long-term interests of the company. The implementation of green supply chain management, although it will increase the cost of enterprises in a short period of time, thus reducing the financial efficiency of enterprises, but it is necessary to improve the reputation of enterprises, enhance long-term sustainable competitiveness, and improve economic performance. Therefore, the following assumptions are made:

H1: Executive characteristics significantly affect green supply chain management practices

H1a: Green supply chain management practices are better when executives are women.

H1b: Executive age is positively related to green supply chain management practices.

H1c: Executive education is positively related to green supply chain management practices.

H1d: Executive tenure is positively related to green supply chain management practices.

## **2.2. GSCM Practice and Corporate Performance (CP)**

GSCM practice was initially driven by external pressures such as firm resources, environmental issues, and related laws and regulations. Therefore, the implementation of GSCM is guided by the protection of the environment and the improvement of environmental benefits. Carter (2018) [8] and other scholars pointed out that the internal environmental management of enterprises is conducive to improving the level of environmental performance, the implementation of comprehensive environmental management within the enterprise, through ISO14001 quality management system certification, green manufacturing, clean emissions and other activities can promote GSCM more Work well to improve the environment. According to the previous review, Julia Wolf (2014) [9] and other scholars believe that the implementation of GSCM is conducive to improving the environmental performance of enterprises. Therefore, this paper proposes the following assumptions:

H2: Green supply chain management practices are positively related to environmental performance (ENP).

H2a: Internal environmental management is positively related to environ-

mental performance.

H2b: External green management is positively related to environmental performance.

Whether the implementation of GSCM practice can bring good economic performance to enterprises is a topic that has long been concerned in the field of management science. However, to date, the academic community has not yet reached a unified view of the relationship between GSCM and economic performance. This paper believes that the resource investment of enterprises at the beginning of GSCM implementation is a long-term investment behavior, and the future return brought by green practice can offset this part of resource investment. For example, green products bring about an increase in green products and market share, and green practices bring about a reduction in clean production costs. Green production of enterprises will also produce intangible benefits, such as consumers' recognition of green products and their willingness to purchase, the government's inclination to corporate policies, and suppliers' trust in corporate partnerships. These future returns from the implementation of green supply chain management will translate into economic performance. Van der Linde (1995) [10] also shows that good economic performance is achieved through technological innovation to achieve environmental goals. The result of environmental innovation will minimize the cost of corporate governance and protection of green practices and even offset this part of the cost. Mitra and Datta (2014) [11] empirically studied the green supply chain management practices of Indian manufacturing plants and their impact on performance, and found that the concept of green supply chain management in Indian manufacturing plants is still in its infancy, but with suppliers. Environmentally friendly practices have a positive impact on environmental sustainability, ultimately forming competitiveness and having a positive impact on economic performance. Therefore, this paper proposes the following assumptions:

H3: Green supply chain management practices are positively related to economic performance (ECP).

H3a: Internal environmental management is positively related to economic performance.

H3b: External green management is positively related to economic performance.

Zhu Qinghua (2004) [12] and others took the Guitang Group as the research object, and studied the effects achieved by adopting GSCM practice. The environmental performance of the company is improving while its operating cost is also reduced. This is because the enterprise and supply the good green cooperative relationship between commercial sugarcane farmers has improved the quality of the company's products while protecting the water and soil environment. Lu and Jiao (2019) [13] studied the data of paper-making and building materials listed companies in 2007-2009, and found that there is a significant positive correlation between environmental performance and financial performance. Therefore, this paper proposes the following assumptions:

H4: After implementing green supply chain management practices, environ-

mental performance is positively correlated with economic performance.

### **2.3. Moderating Effects of Competition Intensity (CI)**

From a market perspective, the more intense the competition, the higher the consumer's recognition and demand for green products. As people pay attention to global environmental issues, consumer demand for environmentally friendly products is growing. In a fiercely competitive environment, commodity homogeneity is very serious, customers can choose more products, and they are more sensitive to products, services and reputation. They are more willing to believe in reputable companies and prefer to buy their green products and service. In this way, the company adopts GSCM, which not only reduces the adverse impact on the environment, but also satisfies the needs of consumers, and thus obtains an improvement in economic performance. Chan (2012) [14] argues that the impact of GSCM on economic performance is more pronounced in a competitive environment than in a low-level competitive environment.

At the same time, domestic and foreign research shows that the intensity of competition can regulate the relationship between environmental strategy and corporate performance. Feng (2016) [15] and other scholars also pointed out that when studying environmental management systems, more consideration should be given to market conditions such as the impact of competitive intensity. They proposed and proved that the intensity of competition can adjust the relationship of environmental management system to financial performance. The greater the intensity of competition, the stronger the relationship. Xu (2018) [16] and other scholars constructed a theoretical model of the relationship between corporate social responsibility, industry competition and financial performance. Based on dynamic competition theory, the perception and motivation of enterprises for social responsibility strategies are affected by the intensity of competition. The more intense the competitive environment, the stronger the motivation of the company to fulfill its social responsibility differentiation strategy, and the greater the likelihood of benefiting from it. Therefore, this paper proposes the following assumptions:

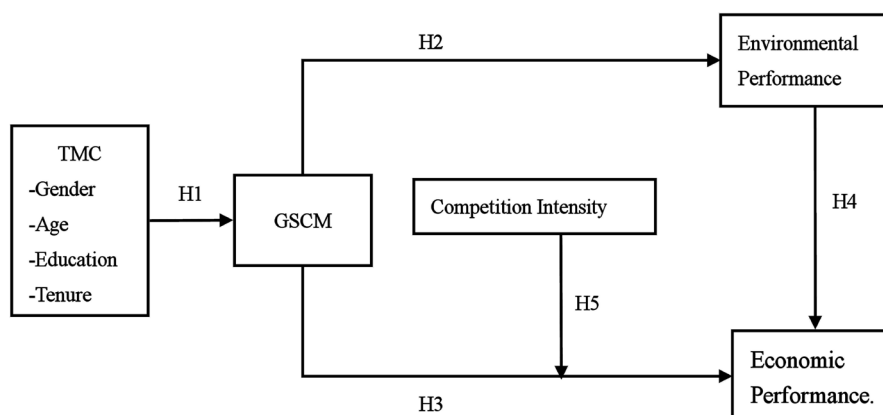
H5: When implementing green supply chain management, the intensity of competition plays a role in regulating the relationship between green supply chain management practices and corporate economic performance. As the intensity of competition increases, the positive impact of green supply chain management practices on economic performance will increase.

Based on the above assumptions, the overall hypothesis model of this paper is shown in **Figure 1**.

## **3. Research Methods**

### **3.1. Sample Determination and Data Source**

This paper uses the fifth global survey data of the Global Manufacturing Research



**Figure 1.** TMC, GSCM and CP relationship hypothesis model.

Group (GMRG) for empirical research. GMRG fifth survey using Likert scale<sup>1</sup> for the manufacturing enterprise, most of problems items. In order to ensure the consistency and readability of the questionnaire in each country and region, the questionnaire is translated into the national language through the research institution before the completion of the questionnaire, and the detailed explanation is filled out before the questionnaire is issued to the surveyed company according to its actual situation. Rate by item. By means of convenient sampling, questionnaires will be issued to MBA/EMBA, alumni and manufacturing enterprises in the form of e-mail or paper questionnaires, with invitations to clarify the purpose of the study and invite them to be most familiar with the green supply chain management project. The person in charge fills out the questionnaire.

In the fifth global survey of GMRG, business samples were distributed in many countries and regions around the world, and a total of 906 valid samples were obtained. In this paper, a total of 251 subsamples from the most representative countries of the United States, China and Vietnam were selected as the target of this study. The basis is as follows: 1) Since the sample is distributed in many countries and regions around the world, if all the choices, the sample data is too scattered and the sample size is too large; 2) the United States, China and Vietnam are different types of practice for green supply chain management of manufacturing enterprises. Typical representative. The United States is a leader in green supply chain management practices. While China's industry is in the stage of transformation and upgrading, the development concept has gradually shifted from "first pollution after governance" to "Lucid waters and lush mountains are invaluable assets.", which is the initiator of green supply chain management practice. Vietnam is in the early and middle stages of industrial development, with backward development concept, low manufacturing technology, and at the bottom of the smiling curve<sup>2</sup> of global value chain. It belongs to the

<sup>1</sup>Likert scale is a psychometric scale commonly involved in research that employs questionnaires. It is the most widely used approach to scaling responses in survey research, such that the term is often used interchangeably with rating scale, or more accurately the Likert-type scale, even though the two are not synonymous.

<sup>2</sup>A curve of smiling mouth, both ends facing up, in the industrial chain, added value is more reflected in both ends, design and sales, the manufacturing added value in the middle link is the lowest.



laggard of green supply chain management practice.

### **3.2. Variable Definition and Measurement**

Mainly based on research questions, the design and measurement of top management characteristics, green supply chain management practices, corporate economic performance and environmental performance, and competition intensity variables are discussed.

#### **3.2.1. Top Management Characteristics**

It mainly measures demographic variables including the gender, age, education level, and term of office of the chairman or general manager of the company (the chairman does not participate in the business management activities of the company or the company does not have a chairmanship). The main reasons are as follows: First, as the core of the senior management team, the chairman or general manager often plays a decisive role in the strategic decision-making and business activities of the enterprise; the second is the personal characteristics measurement of the chairman or general manager in the actual investigation. It's easier, and the characteristics of the entire executive team are not easy to access.

#### **3.2.2. Green Supply Chain Management Practice**

Internal environmental management: generally refers to environmental monitoring of internal production processes and products, as well as support from environmental protection and environmental protection systems, including compliance with environmental regulations, establishment of environmental management systems, implementation of environmental quality management, green manufacturing, and cleaning. Emissions and other actions. In this study, six items of question internal environmental management measure, on behalf of issues such as "your plant identification, control your factory production and environmental impact of the job," one wrote coefficient was 0.964.

External Green Management: Green supply chain management is a sustainable development management model in which the company focuses on internal management and cooperates with external suppliers, customers and other related parties. Therefore, the upstream and downstream enterprises to work together with the core business, more conducive to achieving green management, while improving environmental and economic benefits of enterprise supply chain members. Shang *et al.* (2010) pointed out that manufacturers have green marketing capabilities for their customers, so green supply chain management advantages in the green consumer market can help companies compete better with their competitors. Therefore, green collaboration with customers is external green supply chain management. An important content. This study uses four items to measure external environmental management, such as "green activities of your direct investment suppliers", with a consensus reliability coefficient of 0.923.

#### **3.2.3. Corporate Economic Performance and Environmental Performance**

The performance evaluation of enterprises has formed a relatively perfect system



at home and abroad. Among them, the environmental performance and economic performance obtained by the group of professors Zhu (2004-2008) after fulfilling the practice of green supply chain management have been recognized by many scholars. Wherein the environmental performance with four measurement items title, title economic performance using three measurement items into rows, which are reliability coefficient: 0.913 and 0.870.

#### **3.2.4. Competitive Intensity**

Competitive intensity refers to the intensity of competition between competitors in the industry. A comprehensive literature review, combined with research questions, research reference Ricky YK Chan (2012), Long (2015) [17] and other scholars from industry competition situation, the industry price war, industry barriers to entry and the ability to mimic industry competitors 4 The item was measured with a reliability coefficient of 0.852.

## **4. Empirical Test and Result Analysis**

### **4.1. Descriptive Statistical Analysis**

Through the homogeneity test of variance of executives and the analysis of variance, it is considered that there is no significant difference in the characteristics of executives in the three countries, so they are not described separately. Among them, the proportion of female executives is less than 10%, and most of the top managers are mainly male; most senior managers are between 40 and 50 years old, in line with the actual situation of international and domestic enterprises; The average value of executive education is above 3, indicating that most executives in manufacturing enterprises have bachelor degree or above; from the perspective of senior management, the average term is 7.68 years, but the difference in term is greater, which may be related to The size of the sample enterprise and the difference in the total assets of the company are relatively large.

Through the homogeneity test of variance and the analysis of variance of green supply chain management in each country, each statistic shows that there are significant differences in green supply chain management in three countries. But compared to external green management, companies in three countries pay more attention to internal environmental management. The easiest and most effective way for enterprises to implement green supply chain management is to start from their own and pay attention to the impact of internal environmental protection activities on production and operation. However, the practice of green supply chain management is not only the green practice of core enterprises, it is also a kind of core enterprise as the main body, through the cooperation of upstream and downstream enterprises to achieve the green management mode of the entire industry chain. In addition to developing internal environmental management, enterprises must also change their thinking and develop green management externally, instead of merely considering external green management as an increase in costs. Only with the combination of internal environmental management and external green management, green supply chain

management practices will not be lame and can be more sustainable.

## 4.2. Top Management Characteristics and Green Supply Chain Management

### 4.2.1. Relevant Analysis

This paper uses SPSS20.0 to test the correlation between executive demographic variables and GSCM practice to explain the strength of statistical relationships between variables. The correlation analysis between executive characteristics and green supply chain management practices is shown in **Table 1**. The results show that executive age, education, and tenure are significantly related to green supply chain management practices. In addition, we found that the absolute value of the correlation coefficient between variables is from 0.079 to 0.389, both of which are less than 0.5. It can be considered that there is no collinear problem between variables.

### 4.2.2. Regression Analysis

Correlation analysis has shown the correlation between executives' personal characteristics, GSCM practices and firm performance, and the correlation coefficient is within acceptable limits. Next, multiple regression analysis methods will be used to further explore the impact of executive personal characteristics on GSCM practices and the impact of green supply chain management practices on firm performance.

As shown in **Table 2**, in Model 1, the dependent variable is the green supply chain management practice, the independent variable is the enterprise scale, the F value of the model is 30.902, the significance level is 0.001, and the regression equation is significant; the R side is 0.107, indicating the scale of the enterprise. The overall explanatory power for green supply chain management practices is 10.7%. In Model 2, the independent variable is the four characteristic variables of the executive. The F value of the model is 19.276, the significance level is 0.001, and the regression equation is significant. The R side is 0.226, indicating the overall explanatory power of the enterprise scale to the practice of green supply chain management. At 22.6%. Model 3 adds the enterprise scale control variable based on the model 2. The F value of the model is 15.862, the significance level is 0.001, and the regression equation is significant. The R side is 0.270, indicating

**Table 1.** Relationship between TMC and GSCM.

	Gender	Age	Education	Tenure	GSCM
	1				
Gender	0.065	1			
Age	0.004	0.122	1		
Education	-0.046	0.038	-0.014	1	
GSCM	-0.079	0.288*	0.389**	0.152*	1

Note:\*p < 0.05, \*\*p < 0.01.

**Table 2.** Regression analysis of the impact of TMC on GSCM practices.

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Firm scale	0.332***		0.228***		0.332***		0.329***		0.240***		0.316***
Gender		-0.138	-0.091	-0.079	-0.078						
Age		0.084***	0.249***			0.288***	0.284***				
Education		0.381***	0.295***					0.389***	0.320***		
Tenure		0.148*	0.101							0.152*	0.103
R2	0.107	0.226	0.27	0.02	0.109	0.079	0.185	0.148	0.198	0.019	0.114
F	30.902	19.276	19.535	1.550	16.339	22.546	29.318	44.465	31.838	5.918	17.043
Sig.	0.000	0.000	0.000	0.214	0.000	0.000	0.000	0.000	0.000	0.016	0.000

Dependent variable: GSCM practice; Note: \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.

that the executive characteristics and firm size control variables are applied to the green supply chain management practice. The overall explanatory power is 27%.

Next, the gender, age, education level, and term of the executives will be returned to the green supply chain management practices. In **Table 2**, the dependent variable of Model 4 is the enterprise green supply chain management practice, and the independent variable is executive gender. The model has an F value of 1.550 and an R square of 0.02. The regression equation is not significance and the model fit is poor. Model 5 adds the control variable enterprise scale based on the model 4, the F value is 16.339, the significance is less than 0.001, the regression equation is significant, and the R square is 0.109. The model fit is good, but the standard regression coefficient of gender is still not significant. Comprehensive Model 4 and Model 5 are available. Executive gender characteristics have no significant impact on green supply chain management practices, and H1a is not supported.

In Model 6, the dependent variable is the practice of corporate green supply chain management, and the independent variable is the age of executives. The F value of the model is 22.546, the significance level is less than 0.001, the regression equation is significant, and the R square is 0.079, indicating that the model fits well, and the overall variation of the executive age of the green supply chain management practice is 7.9%. Model 7 adds the size of the control variable to the model 6, and the regression equation is still significant. The R-square is increased from 0.079 to 0.185, indicating that the model fits well. In Model 6, the standard regression coefficient for the independent variable was 0.288, and the significance level was 0.001, indicating that the age of the executive was positively correlated with green supply chain management practices and H1b was validated.

In Model 8, the dependent variable is the practice of corporate green supply chain management, and the independent variable is the level of executive education. The F value of the model is 44.465, the significance level is less than 0.001, the regression equation is significant, and the R square is 0.148, indicating that

the model fit is good, and the overall explanatory power of the senior management age of green supply chain management practice is 14.8%. Model 9 adds the size of the control variable to the model based on Model 7, and the regression equation is still significant. The R-square is increased from 0.148 to 0.198, indicating that the model fits well. In Model 8, the standard regression coefficient of the independent variable is 0.389, and the significance level is 0.001, indicating that the education level of the executive is positively related to the practice of green supply chain management, and H1c is supported.

In Model 10, the dependent variable is the corporate green supply chain management practice, and the independent variable is the executive term. The model has an F value of 5.918, a significance level of less than 0.05, a significant regression equation, and an R-square of 0.019. The overall explanatory power of the senior management term for green supply chain management practices is 1.9%, and the model fit is not ideal. Model 11 adds the size of the control variable to the model 10, and the regression equation is significant. The R-square is increased from 0.019 to 0.114, indicating that the model fits well, but the standard regression coefficient of the term is  $0.087 > 0.05$ , and the standard regression coefficient. Not obvious. Based on the comprehensive model 10 and model 11, although the model fitting is not ideal, it can be found that the executive tenure is positively related to the green supply chain management practice, so we believe that H1d is verified.

### 4.3. Green Supply Chain Management and Corporate Performance

According to the literature review and theoretical assumptions, the design of the GSCM practice and enterprise performance relationship model is shown in **Figure 2**. According to the test of AMOS21.0, the model  $\chi^2/df = 1.98$  (greater than 1 is less than 3), each fitting coefficient exceeds 0.9, and the root mean square RMSEA of approximate error variance is  $0.073 < 0.08$ . It shows that the fitting effect of the whole model is good. Therefore, the results of data analysis using this model are acceptable.

In this paper, Maximum Likelihood (ML) is used as the model estimation method. By solving the established model and fitting the model, the results are shown in **Table 3**.

**Table 3.** Summary of parameters of GSCM practice and CP relationship model.

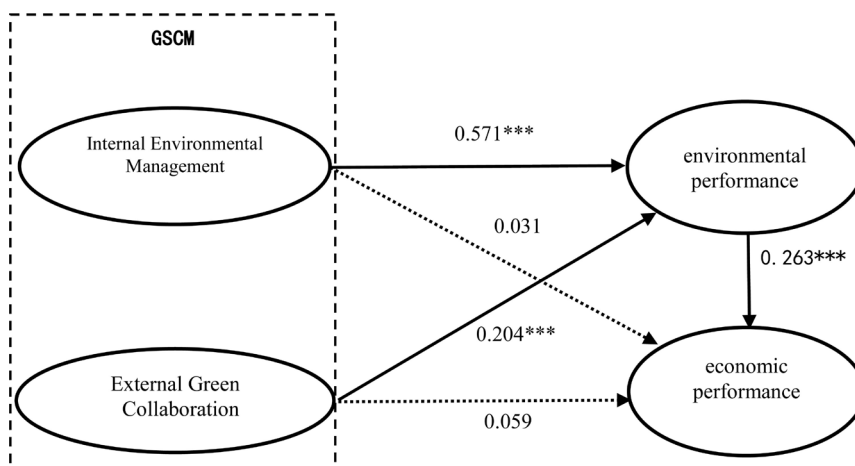
Path relationship	Standardized path coefficient	C.R.
H2a: Internal Environmental Management → ENP	0.571	8.930***
H2b: External Green Collaboration → ENP	0.204	3.513***
H3a: Internal Environmental Management → ECP	0.031	0.339
H3b: External Green Collaboration → ECP	0.059	0.775
H4: ENP → ECP	0.263	3.766***

Note: \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.

According to the above analysis, the standard path coefficient of the green supply chain management and enterprise performance relationship model is shown in **Figure 2**. As can be seen from **Figure 2**, there are three paths P value in the whole model are significant, respectively: from the green supply chain Management practice (internal environmental management, external green management) to environmental performance two paths; from environmental performance to economic performance. Therefore, the hypotheses H2 and H4 mentioned above are verified. The two paths from green supply chain management (internal environmental management, external green management) to economic performance are not significant, assuming H3 is not supported. It is worth noting that from the fitting results of the model, we can find that although the impact of green supply chain management practices on economic performance is not significant, green supply chain management practices significantly positively affect environmental performance, and environmental performance has a significant positive impact. Economic performance. Since the parameters of “green supply chain management practices to environmental performance” and “environmental performance to economic performance” are not zero, we believe that environmental performance plays a mediating role in the relationship between green supply chain management practices and economic performance.

#### 4.4. Moderating Effects of Competition Intensity

It can be seen from the regression results in **Table 4** (Model 1 - Model 4) that the interaction between internal environmental management and competition intensity has a significant impact on economic performance,  $\beta = 0.113$ ,  $p < 0.001$ . It can be seen from the adjustment action diagram that the adjustment effect of competition intensity on internal environmental management and economic performance is enhanced. When the competition intensity is large, the positive impact of internal environmental management on economic performance is enhanced. That the intensity of competition has a significant positive adjustment effect in the relationship between internal environmental management



**Figure 2.** Standardized path coefficient diagram of GSCM and CP relationship model 3.

**Table 4.** The adjustment effect of CI on the relationship between internal and external environmental management and ECP.

	Internal Environmental Management				External Green Collaboration			
	M1	M2	M3	M4	M5	M6	M7	M8
Firm scale	0.055	0.053	0.062	0.071	0.055	0.042	0.084	0.061
Internal Environmental Management		0.149	0.217*	0.279**				
External Green Collaboration						0.061	0.079*	0.157**
Competition Intensity			0.123**	0.119**			0.148**	0.129**
Internal Environmental Management * CI				0.113***				
External Green Collaboration * CI								0.14**
R <sup>2</sup>	0.041	0.047	0.217	0.235	0.004	0.158	0.209	0.252
Adjust R <sup>2</sup>	0.036	0.038	0.195	0.269	0.036	0.127	0.193	0.239
ΔR	0.021	0.060	0.093**	0.23***	0.002	0.11*	0.075**	0.22**
ΔF	2.278	6.993	12.35**	25.531***	2.278	4.967	10.32**	22.891**

Dependent variable: economic performance; Note: \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.

and economic performance. The more competitive the market environment in which enterprises are located, the greater the economic performance obtained by enterprises in implementing internal environmental management. Thus, H5a is verified.

It can be seen from the regression results of the table (Model 5 - Model 8) that the interaction between external green management and competitive intensity has a significant impact on economic performance,  $\beta = 0.14$ ,  $p < 0.01$ . It can be seen from the adjustment action chart that the adjustment effect of competition intensity on external green management and economic performance is enhanced. When the competition intensity is large, the positive impact of external green management on economic performance is enhanced. That is to say, the intensity of competition has a significant positive adjustment effect in the relationship between external green management and economic performance. The more competitive the market environment in which enterprises are located, the greater the economic performance obtained by enterprises in implementing external green management. Thus, H5b is verified.

In summary, H5 has been verified, that is, when implementing green supply chain management, the intensity of competition plays a role in regulating the relationship between green supply chain management practices and corporate economic performance. As the intensity of competition increases, the positive impact of green supply chain management practices on economic performance will increase.

## 5. Discussion and Conclusion

### 5.1. Discussion and Conclusion

The results of this paper show that although female executives are better at implementing green supply chain management practices than male executives, the

impact of female executives on green supply chain management practices is not significant. This may be related to the fact that the proportion of women in the actual production management is very low, and the proportion of female executives in this sample is less than 10%. Further research is needed on whether female executives can have a significant impact on green supply chain management practices. Executive age is significantly positively correlated with green supply chain management practices. Relative to older executives, older executives are more proactive in implementing green supply chain management, which is consistent with previous research (Dushnitsky, 2015; Carlsson, Karlsson, 1970). The educational level of executives is significantly positively correlated with green supply chain management practices, consistent with the findings of Sun (2017) and Wang (2015). In general, the level of education reflects the manager's cognitive ability and overall quality, including learning ability, judgment ability, innovation and change ability, adaptability, and the ability to acquire various resources. The term of senior management is significantly positively correlated with green supply chain management practices, consistent with the findings of Sun (2017) and Zhang (2016). The longer a senior manager is appointed, the more loyal he is to the organization, and the more likely it is to make strategic decisions based on the long-term interests of the company. Green supply chain management, although it will increase the cost of the company in the short term, may damage the financial performance of the company, but in the long run, it will improve the competitiveness of the company and improve its economic performance.

The results of structural equation fitting show that the implementation of GSCM practice can significantly promote the improvement of environmental performance. The causal effect coefficients of internal environmental management and external green practices on environmental performance are 0.571 and 0.204 respectively. Enterprise GSCM practice is a systematic process from internal management of the supply chain to external green management. The GSCM practice has no significant effect on economic performance. Another structural equation model shows that the path coefficient of environmental performance to economic performance is 0.263. Environmental performance plays a mediating role in the relationship between green supply chain management practice and economic performance, which means green supply chain management practices can improve economic performance by improving environmental performance.

The final empirical results show that the intensity of competition can significantly adjust the relationship between GSCM practice and corporate economic performance, and when the intensity of competition increases, the positive impact of GSCM practice on economic performance will be strengthened.

## 5.2. Research Enlightenment

Based on the above research results, the following are some of the following implications for the status quo of green supply chain management: 1) Improve the screening, assessment and incentive system for corporate executives from an en-



vironmental perspective. Today, when environmental protection concepts are prevailing, environmental regulations are increasingly strengthened, and environmentally-friendly products and green products are becoming the new normal, corporate screening and selection of senior managers must be based not only on economic and management reasons, but also on the needs of sustainable social development. 2) Continue to strengthen green supply chain management. Enterprises actively implement green supply chain management practices, which can meet the needs of stakeholders, such as meeting government legal and regulatory requirements, creating better supply chain member partnerships, meeting consumers' preferences for green products, and the like. Green supply chain management practices improve environmental benefits and enhance the competitiveness of enterprises. In the long run, they can have a good mutual effect on the economic benefits of enterprises. 3) The company actively raises the awareness of social responsibility, and actively incorporates green management into the corporate strategy and daily production and management of the enterprise, striving to achieve the balance and win-win situation of the economic, environmental and social triple bottom line. In addition to clarifying the importance of green supply chain management, enterprises should also actively explore ways of green supply chain management practices. In addition to continuing to strengthen internal environmental management, it is also necessary to strengthen green cooperation with upstream and downstream enterprises. 4) As the country's macro-controllers, the government is crucial in guiding social green trends, advocating mass green consumption, and promoting enterprises to fulfill green supply chain management. The government should actively participate in the implementation of green supply chain management practices.

The limitations of this paper are as follows: The data in this paper is derived from the research of the Global Manufacturing Research Group (GMRG). The sample companies have a wide range of sources, resulting in a relatively scattered data. Although the research objects are all manufacturing enterprises, the manufacturing enterprise industry is a very broad concept, and in the future research, it is possible to consider the research scope in a specific industry. In addition, the data used in this paper is cross-sectional data, not time-series data, which may have an impact on the conclusions of the study.

### **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

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