



Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/19483
DOI URL: <http://dx.doi.org/10.21474/IJAR01/19483>



RESEARCH ARTICLE

STRATEGIC INTERPLAY IN GREEN SUPPLY CHAINS: GAME THEORETICAL INSIGHTS INTO PERFORMANCE, GREEN MARKETING

Ismail Haloui and Li Yang and Siham Haloui

School of Economics and Management, Anhui University of Science and Technology, Huainan 232001, China.

Manuscript Info

Manuscript History

Received: 15 July 2024

Final Accepted: 17 August 2024

Published: September 2024

Key words:-

Green Marketing, Customer Satisfaction,
Decision Making, Competition,
Cooperation

Abstract

Given the widespread acceptance of green protection concepts, it is especially crucial to ensure consumer satisfaction in the green supply chain through green marketing. This study examines pricing and green marketing techniques that are competitive and cooperative, with a focus on consumer pleasure. Utilizing a game theory reaction function model. It concludes that shops with a larger market share may not always have higher profitability, and that the ideal pricing is not always proportionate to green marketing efforts due to the role of consumer satisfaction. In certain instances, the manufacturer should actively assist retailers in enhancing their green marketing efforts in order to boost sales, even if the manufacturers are competitors. Lastly, we observe that the cooperative approach in an eco-friendly supply chain is impacted by the connection between Customer satisfaction and green marketing.

Copyright, IJAR, 2024.. All rights reserved.

Introduction:-

As a result of the growing environmental problems brought on by human activity in terms of production and consumption. Research on green supply chain management is growing due to the idea of sustainable development, which includes low carbon economies and green GDP (Karakayali et al., 2017; Lee et al., 2022). Green supply chain management requires chain participants to reevaluate a number of issues, including channel player coordination, inventory decisions, product innovation, returns management, and reverse logistics design (Guide and Wassenhove, 2012 a,b; Ostlin et al., 2008). The adoption of a green supply chain can improve a company's economic and environmental performance, which encourages the firm to keep moving toward a more environmentally friendly way of making decisions. Furthermore, in order to safeguard customers' knowledge of the environment and the concept of "green" consumption has steadily grown (Wang, 2022). To further extend their green markets and meet the green expectations of their customers, an increasing number of companies have also established green supply chains and engaged in green marketing (Tsai et al., 2020). Combining the words "green" and "marketing," green marketing seeks to persuade consumers to buy pertinent green goods and services, such as those that involve green production, packaging, promotion, etc. Businesses want to lessen the environmental effect of their production process by using green inputs.

Customer satisfaction with green marketing is another factor. Customers would feel satisfied and actively advocate green marketing if it can satisfy their expectations and demands (Chen, 2010). However, unhappy customers will not repurchase goods and services, which will cost the system money. For instance, Volkswagen was found guilty of emissions fraud in 2015 and has since lost over 32 billion in penalties, legal fees, and vehicle modifications, all

Corresponding Author:- Ismail Haloui

Address:- School of Economics and Management, Anhui University of Science and Technology, Huainan 232001, China.

while continuously lowering its carbon emissions and extending its sincere apology to customers in an attempt to win back their faith. Consequently, decisions made about the green supply chain are greatly influenced by consumer satisfaction.

The choices and advantages of supply chain participants are influenced by collaboration and competition. Green marketing can, on the one hand, enhance a company's competitiveness by fostering a positive green image; nevertheless, it also entails additional costs and raises sales prices (Lou et al., 2020). Consumers anticipate paying less for environmentally friendly goods. In order to improve the match between green products and customer needs, maintain market competitiveness, and balance green marketing and product price, manufacturers and merchants must resolve this contradiction. Thus, taking into account the collaboration and competition of dual-channels increases the complexity of supply chain decision-making.

Furthermore, green marketing—which involves retailers and manufacturers working together in the supply chain and competing in the consumer market—is a successful strategy for improving performance. The majority of supply chains include a retailer and a direct manufacturer channel. In actuality, though, producers typically distribute their goods via a number of retail outlets. Manufacturers must work with retailers like Walmart to lessen the pressure from numerous retailers when a channel is facing competition from these stores, and their suppliers must work together to build an environmentally friendly supply chain in order to get a larger market share (Hong et al., 2019).

In order to answer the following question: how does green marketing affect each member's strategy and profits?—we investigate pricing competition and cooperation strategies when supply chain participants engage in green marketing in the context of retailer-retailer cooperation and retailer-manufacturer cooperation, respectively. How do collaboration and rivalry impact the choices and advantages of supply chain participants?

Literature Review:-

There are six principal streams related to this study: Performance of the Organization, Practices of Supply Chain Management, Green marketing, Green supply chain management, Client contentment, Collaboration and rivalry in the supply chain.

Performance of the Organization

The term "organizational performance" describes how well an organization meets its goals in terms of both financial and market-oriented objectives. Short-term objectives of supply chain management include lowering cycle times and inventories while raising organizational productivity.

On the other hand, the organization's long-term objective is to grow its earnings and market share. Businesses have evaluated their performance using financial measures (Holmberg, 2000). The performance of the organization is impacted by every activity undertaken by it, including supply chain management. Numerous prior studies have been carried out to gauge the performance of the business based on factors such as overall competitive position, market share gains, sales growth, ROI, profit margin, and sales.

Practices of Supply Chain Management

The idea of supply chain management was first presented in the late 1980s. Conventional logistic management served as the foundation for its development. Prior to the adoption of this idea, businesses were viewed as a single entity with only tenuous ties to other businesses, or what are known as their competitors. Therefore, when making decisions, the organizations took into account internal processes and flows. The organizations optimized the flows and processes without taking other organizations into account. As a result, the optimization cost was either moved upstream or downstream. Consequently, it had no impact on the organization's output. The focus of supply chain management is on internal and external flow and processes. In 2005, Mangan and Christopher

Green marketing

Environmental sustainability awareness have increase significantly in past decades, since firms have gradually adopt environmental protection into the concept of production and marketing processes, research and development. Consumers are paying more attention to the environmental impact of products and the use of green marketing by enterprises (Chen and Yang, 2019). Thus, Dangelico and Vocalelli, (2017) define green marketing as the development and implementation of marketing programs designed to enhance the environmental image of enterprises. Further,

Chou et al(2020) discovers that environmental feelings significantly and favorably influence green consumption attitudes, and that their impact is greater than the impact of ecological knowledge on green consumption behavior. As a result, for green marketing to be effective, it must link consumers' feelings to environmental issues.

Green supply chain management

The 'cleaner production refers to the comprehensive integration of green design and green production technology. As cleaner production emphasizes the prevention of pollution during the product development, production and service-provision processes, it helps improve the utilization efficiency of raw materials and resources and reduce the environmental impact of the entire product life cycle. Therefore, in addition to enhancing corporate image, cleaner production could improve firms' competitiveness (Yang et al., 2015). Lee and Hussain (2022) developed a green game model to show that carbon emission taxes and subsidies on green investment can help governments generate revenue and clean up the environment. Guo et al. (2020) constructed a game model of product greenness, and the study showed that the optimal green level is inversely proportional to the intensity of market competition. Wang and Song (2020) explored pricing decisions for green investment and sales efforts under demand uncertainty.

Client contentment

In an effort to protect the environment, the majority of consumers are starting to think about green consumption (Wang, 2022). Research has indicated a favorable correlation between the level of green preference and consumer demand for environmentally friendly items (Meng et al., 2021). According to Wang and Hou's (2020) research, supply chain participants may overreact to consumer preferences for green products, which could lead to fierce rivalry and jeopardize the stability of the market. Zhu et al. (2022) distinguished between ordinary and green consumers, demonstrating that a rise in the former group's green preferences would boost the profitability of the entire green supply chain.

Collaboration and rivalry in the supply chain

More and more manufacturers are creating direct channels since they can obtain a cost-effective competitive advantage through them (Cai et al., 2009). Retailers can profit from the drop in wholesale pricing, while manufacturers can advertise their brands through direct channels (Bernstein et al., 2009). (Arya et al., 2007)

Model description and result analysis

As seen in Fig. 1, this research focuses on a manufacturer and two merchants. In order to satisfy consumers' green demands, manufacturers and retailers collaborate to invest in green marketing campaigns. Manufacturers create eco-friendly products, while retailers offer eco-friendly packaging and product promotion. R1, R2, and M stand for two retailers and the manufacturer, respectively. The manufacturer produces the green product at cost c and sells it to two merchants at wholesale prices w_1 and w_2 .

Where $0 < c < w_i$ ($i = 1, 2$) $< p_k$ ($k = 1, 2, 3$), R1, R2, and M sell products at pricing p_1 , p_2 , and p_3 and green marketing efforts g_1 , g_2 , respectively.

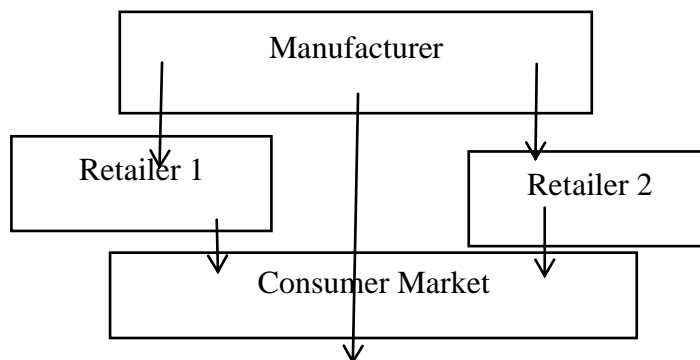


Figure 1:- Model structure.

Assumption:

Assuming two merchants work together to take on the manufacturer, they set their prices for products and engage in green marketing by aiming to maximize their overall profit. Our assumptions will be split into two models: We refer

to this type of retailer cooperation as the RC model. We refer to a retailer's decision to work with a manufacturer as the RM model. Each member's profit is as follows:

$$\begin{aligned}
 u_1 &= (p_1 - w_1 - c_g - C_r) D_1 \\
 u_2 &= (p_2 - w_2 - c_g - C_r) D_2 \\
 u_3 &= (p_3 - c_g - C_m) D_3 + \sum_{i=1} (w_i - c) D_i
 \end{aligned}$$

The RC model can be expressed as follows:

$$\begin{aligned}
 \max u_3 &= (p_3 - c_g - C_m) D_3 + \sum_{i=1} (w_i - c) D_i \\
 p_1, p_2 = \max u_4 &= \sum_{i=1} (p_i - w_i - c_{gi} - C_r) D_i
 \end{aligned}$$

The best prices for the retailers are as follows, given that the profit function is jointly concave in g_k and w_i :

$$P1 = \frac{(2w_1 + ng^2)(\alpha_1^2 - \beta^2) - 2\theta_1(\beta g_1 + \alpha g_2) + 2g\rho\alpha_1 - \beta + (\gamma p_3 - \theta_2 g_0)(\alpha_1 + \beta) + 2(\alpha_1 g_1 + \beta g_2)(t + \theta_1 + \theta_2) + 2\beta q\rho}{4(\alpha_1^2 - \beta^2)}$$

$$P2 = \frac{(2w_2 + ng^2)(\alpha_1^2 - \beta^2) - 2\theta_1(\beta g_1 + \alpha g_2) + 2g\rho\gamma(\alpha_1 - \beta) + 2(\gamma p_3 - \theta_2 g_0)(\alpha_1 + \beta) + 2(\alpha_1 g_1 + \beta g_2)(t + \theta_1 + \theta_2) + 2\alpha_1 q\rho}{4(\alpha_1^2 - \beta^2)}$$

The green marketing campaign has an impact on the ideal pricing. We possess:

We examine the effects of various parameters on the choices and earnings of each channel in this topic. Drawing from extant literature (Pi et al., 2019),

we set $g = 50, \alpha_1 = 2, \alpha_2 = 2.5$

$\rho = 0.51, \lambda = 0.52, \beta = 0.35, \gamma = 0.51, t = 0.5, \theta_1 = 0.3, \theta_2 = 0.4, c = 3, \eta = 0.1, \tau_1 = 0.55, \tau_2 = 0.45, g_1 = 3, g_2 = 3,$

In the model, $w_1 < w_2$.

$$\frac{\partial p_1}{\partial g_1} = 2ng_1 + 2 > 0$$

$$\frac{\partial p_2}{\partial g_2} = 2ng_2 + g_2 > 0$$

shows that each channel's ideal price in the model is correlated with its green marketing initiatives. demonstrates how the price/green marketing effort coefficient and cross-price/green marketing effort coefficient between the online and retail channels affect how much one channel's green marketing efforts affect the prices of other channels in the RM1 and RM2 models.

The ideal solution values are listed in Table 1.

P1	P2	P3	W1	W2	U1	U2	U3	g1	g2
11.48	10.85	9.92	8.26	8.02	9.87	9.06	101.56	8.008	5.013

Discussion:-

First, the company modifies its cooperative strategy in response to shifts in a rival retailer's green marketing initiatives. Table 1 demonstrates that retailer 1 prefers to work with the manufacturer when gr_2 is little and retailer 2 when gr_2 is large. After working with retailer 1, the manufacturer's profit rises with gr_2 as a result of lessened competition and higher wholesale income.

Retailers can obtain a competitive edge by collaborating with manufacturers, for example, by lowering wholesale prices. This kind of cooperation is especially noticeable in the retail sector.

Additionally, it can be concluded that retailer 1 should cooperate with the manufacturer when supply chain green marketing effort exceeds customer satisfaction, and that retailer 1 should cooperate with retailer 2 when supply chain green marketing effort falls short of customer satisfaction.

Conclusion:-

This study examines cooperation and rivalry strategies in green supply chains while taking consumer happiness into account. Customer satisfaction has a significant influence on the supply chain's green marketing inputs, which

are the primary component of a green supply chain. In order to investigate this problem, we set up a green supply chain channel with two merchants and a manufacturer, respectively. The findings indicate that there isn't always mutual cooperation between the two retailers.

Furthermore, we discover that in order for manufacturers and retailers to meet more market demand, they must simultaneously increase their green marketing initiatives and reduce product pricing when their level of consumer satisfaction is significantly lower than their green marketing efforts.

References:-

- [1] Wang et al., 2020. Pricing decisions in a dual-channel green supply chain with product customization J. Clean. Prod., 247 (2020), Article 119101, 10.1016/j.jclepro.2019.119101.
- [2] Kurata et al., Yao, J.J. Liu 2007. Pricing policies under direct vs. indirect channel competition and national vs. store brand competition Eur. J. Oper. Res., 180 (1) (2007), pp. 262-281.
- [3] Lee and Hussain, 2022. Optimal behavior of environmental regulations to reduce carbon emissions: A simulation-based dual green gaming model Environ. Sci. Pollut. Res. (2022), pp. 1-18, 10.1007/s11356-022-19710-0.
- [4] Guide, V.D.R., Wassenhove, L.N., 2006a. Closed-loop supply chains: an introduction to the feature issue (Part 1). Prod. Oper. Manag. 15 (3), 345e350.
- [5] Chen, 2010. The drivers of green brand equity: Green brand image, green satisfaction, and green trust J. Bus. Ethics, 93 (2) (2010), pp. 307-319, 10.1007/s10551-009-0223-9.
- [6] Wang and Hou, 2020. A duopoly game with heterogeneous green supply chains in optimal price and market stability with consumer green preference J. Clean. Prod., 255 (2020), Article 120161, 10.1016/j.jclepro.2020.120161.
- [7] Tsai P.H., Lin G.Y., Zheng Y.L., Chen Y.C., Chen P.Z., Su Z.C 2020.Exploring the effect of Starbucks' green marketing on consumers' purchase decisions from consumers' perspective J. Retail. Cons. Serv., 56 (2020), Article 102162.
- [8] Lou et al., 2020. Coordination in a composite green-product supply chain under different power structures Ind. Manage. Data Syst., 120 (6) (2020), pp. 1101-1123, 10.1108/IMDS-10-2019-0532.
- [9] Hong et al., Wang H., Gong Y 2019. Green product design considering functional-product reference Int. J. Prod. Econ., 210 (2019), pp. 155-168, 10.1016/j.ijpe.2019.01.008.
- [10] Cui, L., Chan, H.K., Zhou, Y., Dai, J., Lim, J.J., 2019. Exploring critical factors of green business failure based on Grey-Decision Making Trial and Evaluation Laboratory (DEMATEL). J. Bus. Res. 98, 450–461.
- [11] Dangelico, R.M., Vocalelli, D., 2017. "Green Marketing": an analysis of definitions, strategy steps, and tools through a systematic review of the literature. J. Clean. Prod. 165, 1263–1279.
- [12] Yang, J., Zhang, F., Jiang, X., Sun, W., 2015. Strategic flexibility, green management, and firm competitiveness in an emerging economy. Technol. Forecast. Soc. Change 101, 347–356.
- [13] Guo, S., Choi, T.M., Shen, B., 2020. Green product development under competition: A study of the fashion apparel industry. Eur. J. Oper. Res. 280 (2), 523–538. <http://dx.doi.org/10.1016/j.ejor.2019.07.050>.
- [14] Lee, C.C., Hussain, J., 2022. Optimal behavior of environmental regulations to reduce carbon emissions: A simulation-based dual green gaming model. Environ. Sci. Pollut. Res. 1–18. <http://dx.doi.org/10.1007/s11356-022-19710-0>.
- [15] Meng, Q., Li, M., Liu, W., Li, Z., Zhang, J., 2021. Pricing policies of dual-channel green supply chain: Considering government subsidies and consumers' dual preferences. Sustain. Prod. Consum. 26, 1021–1030. <http://dx.doi.org/10.1016/j.spc.2021.01.012>.
- [16] Zhou, F., Wang, X., 2022. The carbon emissions trading scheme and green technology innovation in China: A new structural economics perspective. Econ. Anal. Policy 74, 365–381. <http://dx.doi.org/10.1016/j.eap.2022.03.007>.