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Operation Strategies of Green Supply Chain Members with Short-Sighted and Far-Sighted Behavior: A Differential Game Theory Approach

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Abstract: The concept of "green supply chain" has gained increasing attention in the pursuit of sustainable development by enterprises globally, leading to the optimization of supply chain management. However, the behavior patterns of some members in green supply chains exhibit differences. Hence, analyzing the choices of different behavior patterns among green supply chain members is of practical significance in improving supply chain governance and achieving sustainable development. In this study, a differential game model is constructed using differential game theory to analyze the behavior patterns among members of a green supply chain. Analytical solutions under different models are obtained with the aid of Bellman continuous dynamic programming theory, and comparative analysis and numerical examples are carried out to explore the operation strategies of green supply chain members and the choice of short-sighted and far-sighted behavior patterns. Our findings indicate that suppliers playing a leading role in the green supply chain should exhibit far-sighted behavior as decision makers, while retailers should also display far-sighted behavior. This study adopts a dynamic perspective and is innovative and cutting-edge, providing targeted recommendations for enterprises and serving as a reference for the future development of green supply chain management.

Keywords: Green supply chain; Short-sighted behavior; Far-sighted behavior; Dynamic scope

1 Introduction

The development of the social economy has led to increasingly severe ecological problems, which have become a major obstacle to sustainable economic development. In response, the Chinese government has issued a series of policies aimed at promoting green planning and production, including the establishment of green supply chains that prioritize efficient resource utilization, ecological protection, and effective greenhouse gas control. Many enterprises have recognized the importance of sustainable development and have therefore established green supply chains to manage their operations. Green supply chain management is a management model that prioritizes environmental protection and aims to achieve sustainable development of the economy, environment, and society. In the context of globalization, informationization, marketization, and personalization, the implementation of green supply chain management can effectively reduce the impact of production on the environment, improve corporate image and reputation, reduce operating costs, and improve economic and social benefits. The implementation of green supply chain management not only reflects the social responsibility of enterprises but also provides an important opportunity for their future development. As a result, green supply chain management has received more and more attention and support from enterprises worldwide [1–4].

In the face of a turbulent green market environment, enterprises need to make different operational decisions based on different market environments. The formulation of operational strategies for green supply chain members has therefore become an urgent issue that requires theoretical guidance from the academic community. Since green supply chain management involves collaboration and competition among different members, the short-sighted and far-sighted behaviors of green supply chain members will have an important impact on the efficiency and sustainability of the supply chain. Effectively analyzing the choice of short-sighted and far-sighted behavioral patterns of green supply chain members is therefore crucial in the field of green supply chain management [5].

Managers with short-sighted behavior ignore the impact of decisions on the future and are only concerned with short-term performance, while managers with far-sighted behavior take into account the impact of current strategies on current interests and future profits [6]. However, it has also been shown that when faced with different market environments, sometimes firms benefit more by exhibiting short-sighted behavior instead [7]. Therefore, short-sighted and far-sighted behavior plays a crucial role in the management of enterprises, especially green supply chains.

This paper will consider the behavioral factors of both green suppliers and green retailers in the green supply chain, study the behavioral operational decisions in a dynamic environment when both members of the green supply chain exhibit short-sighted behavior and both exhibit far-sighted behavior, explore the choice of behavioral patterns of green supply chain members from different perspectives, and answer the following questions: (1) How should the operational strategies of green supply chain members be formulated when both green suppliers and green retailers exhibit far-sighted behavior? (2) How should the operational strategies of green supply chain members be formulated when both green suppliers and green retailers show short-sighted behavior?

The contribution of this article lies in providing a theoretical analysis basis for relevant departments to formulate operational strategies and economic development under the ”dual carbon” goal, which has practical research significance. Based on the perspective of consumers, a comprehensive analysis of the behavior patterns of green supply chain members and consumers is beneficial for promoting the operation of green supply chain enterprises, guiding economic development and industrial layout optimization, creating a green, harmonious, and comfortable external environment, and exploring the path to achieving the “dual carbon” goal.

2 Literature Review

The following is a review of research themes closely related to the theoretical and research significance of this paper: green supply chain, short-sighted and far-sighted behavior, dynamic scope, and differential game.

In the field of green supply chain research, relevant literature has been reviewed to analyze the impact of carbon regulations on green supply chain network design (GSCND) [8]. A game model has been constructed to study a two-level green supply chain, demonstrating the effectiveness of bargaining approaches in increasing the level of greenness and overall profit of the product [5]. Pricing strategies of green supply chain members have been studied under different channels and policies, with a comparative analysis and numerical calculations showing that dual-channel green supply chains are more efficient than single-channel green supply chains [9]. A decision support model has been constructed based on a combination of life cycle cost (LCC) and life cycle assessment (LCA) methods to study additive manufacturing in green supply chains [10]. The impact of financial incentives with emission reduction constraints on operational decisions and environmental performance of capital-constrained supply chains has been investigated, revealing that green credit subsidy policies can increase more social welfare under certain conditions [11]. A green supply chain (GSC) has been studied, analyzing different information structures and finding that suppliers prefer a mandatory disclosure strategy and retailers' tendency is influenced by the combined effect of wholesale price and green level on demand [12]. A two-channel green closed-loop supply chain has been constructed, demonstrating that the ring performance is globally optimal in the centralized scenario [13].

Research on short-sighted and far-sighted behavior of members has discussed the impact of short-sighted behavior of retailers on dynamic pricing and advertising strategies of members, revealing that retailers choose to exhibit short-sighted behavior in certain situations and will earn higher profits as a result [14]. The effects of short-sightedness of retailers on channel membership strategies and single-manufacturer single-retailer distribution networks have been studied, revealing that manufacturers would increase their marketing efforts to respond to short-sighted retailers, but their own performance would be impaired [15]. The role of green subsidies in the international cross-border pollution game has been explored, revealing that the optimal abatement policy will be much lower when some developing countries exhibit short-sighted behavior [16]. The problem of reputation adjustment and the choice of innovation paths based on new media participation has been studied, finding that for platforms with short-sighted behavior, a high pressure regulatory environment and public opinion regulation are effective in inhibiting excessive innovation, while for platforms with far-sighted behavior, a moderate relaxation of regulatory public opinion pressure is optimal [17].

In the area of differential games and dynamic spheres, a dynamic game model has been constructed to study the cooperation between private label (PL) retailers and national brand (NB) manufacturers under a carbon trading policy [18]. The Stackelberg differential game has been investigated for the optimal control of supply chain management marketing channels [19], and a modified Nerlove-Arrow model has been used to derive the equilibrium decisions of channel members [20]. While Stackelberg differential games have been widely used in supply chain management to study inventory problems, pricing strategies, and coordination problems in dynamic environments, few have considered the use of differential games to analyze the operational decision problems when green supplier members have different behavior patterns.

3 Problem Description and Model Assumptions

A green supply chain is considered, consisting of a green product supplier S, a green retailer R, and a consumer. The leader of the chain, denoted as S, optimizes returns by setting the green quality level $q(t)$ and wholesale price $w(t)$ of the product, while the channel follower, denoted as R, maximizes profits by setting the retail price $p(t)$ of the green product. The dynamic environment of goodwill is used to describe the system, investigating the strategies that green supply chain members should adopt when both green suppliers and green retailers act farsightedly or short-sightedly, and the impact on corporate profits. The following hypotheses are proposed:

Hypothesis 1: The quality level of the green product provided by the green supplier is the basis for establishing brand goodwill of green products [21]. Brand goodwill is dynamic and changes over time, and will fade as consumers forget about the green product or as other green brands from the same industry rise and gradually diminishes. The state variable is denoted as $G(t)$ and its kinetic equation is [22]:

$$\dot{G}(t) = \gamma q(t) - \delta G(t); G(0) = G_0 > 0 \tag{1}$$

where, *q(t)* represents the quality level of the green product,$\gamma > 0$ is the influence factor of the quality level on brand goodwill, and the larger γ indicates a greater influence of *q(t)* on *G(t)*. $\delta > 0$ is the decay factor of *G(t)*. $G_0 > 0$ represents the goodwill at the initial moment.

Hypothesis 2: Consumers pay attention to both the price and the brand goodwill of green products when making purchasing decisions [23]. The quality level of the product indirectly affects demand by directly influencing brand goodwill. The reference price, denoted as $R_p(t) = \xi\sqrt{G(t)}$, is formed based on the product goodwill, and affects market demand [24]. To emphasize the research focus of this paper, which is to develop operational strategies for green supply chain members, and based on relevant literature [25], the market demand function is constructed as follows:

$$D(t) = \beta\left(R_p(t) - p(t)\right) + \theta\sqrt{G(t)} \tag{2}$$

where, $R_p(t)$ is the reference price, ξ indicates its significant dependence on the goodwill of the green products, *P(t)* is the green product price, $\beta\left[R_p(t) - p(t)\right]$ represents the reference price effect, and $\beta > 0$ is the effect of the reference price on demand. The coefficient of action of *G(t)* on *D(t)* is denoted as $\theta > 0$. From Eqs (1) and (2), we obtain Eq. (3).

$$D(t) = \Phi\sqrt{G(t)} - \beta p(t) \tag{3}$$

Among them, $\emptyset = \theta + \beta\xi$.

Hypothesis 3: The quality level of the green supplier is positively related to the cost [26]. The cost of the green supplier is $\frac{1}{2}kq^2(t)$ at time *t*, and the profit of the green supplier is:

$$\pi_S = w(t)\left[\Phi\sqrt{G(t)} - \beta p(t)\right] - \frac{1}{2}kq^2(t) \tag{4}$$

where, $w(t)$ is the wholesale price set by the green supplier and $k > 0$ is the influence factor of quality cost. The profit of the retailer is:

$$\pi_R = [p(t) - w(t)]\left[\Phi\sqrt{G(t)} - \beta p(t)\right] \tag{5}$$

4 Model Analysis

Based on the above assumptions, this section proposes a Stackelberg dynamic equilibrium strategy for enterprise members under two distinct behavioral patterns: green supplier foresight and green retailer foresight (*FF*), and green supplier foresight and green retailer foresight (*MM*). The operation and marketing strategies of enterprise members are analyzed under different circumstances. Comparative static analysis is employed to explore the changes that different behaviors bring to the enterprise. In the following, superscripts and represent the two different combinations of behavior patterns, while subscripts and represent the green suppliers and green retailers, respectively.

4.1 Visionary Green Suppliers and Visionary Green Retailers (*FF*)

Proposition 1: For the FF mode, the Stackelberg differential game can be expressed as follows:

$$\max_{w(\cdot),q(\cdot)} \left\{ J_S^F = \int_0^{+\infty} e^{-rt} \left[w(t)[\Phi\sqrt{G(t)} - \beta p(t)] - \frac{1}{2}kq^2(t) \right] \mathrm{d}t \right\}$$
$$\text{s.t.} \left\{ \begin{array}{l} \dot{G}(t) = \gamma q(t) - \delta G(t), G(0) = G_0 \\ \max_{p(\cdot)} \left\{ J_R^F = \int_0^{+\infty} e^{-rt}[[p(t) - w(t)][\Phi\sqrt{G(t)} - \beta p(t)]]\mathrm{d}t \right\} \end{array} \right.$$

By applying the reverse induction method in Stackelberg differential games, the following conclusions can be drawn:

(1) The strategies are

$$w^{FF} = \frac{\Phi\sqrt{G^{FF}}}{2\beta}; q^{FF} = \frac{\gamma\Phi^2}{8\beta k(\delta + r)}; p^{FF} = \frac{3\Phi\sqrt{G^{FF}}}{4\beta}$$

(2) The time evolution paths of G^{FF} and R_p^{FF} are respectively

$$G^{FF} = \frac{\gamma^2\Phi^2}{8\beta k\delta(\delta + r)} + e^{-\delta t}\left(G_0 - \frac{\gamma^2\Phi^2}{8\beta k\delta(\delta + r)}\right); R_p^{FF} = \xi\sqrt{G^{FF}}$$

(3) The profits of S and R are respectively

$$V_M^{FF} = \frac{\Phi^2}{8\beta(\delta + r)}G^{FF} + \frac{\Phi^4\gamma^2}{128kr\beta^2(\delta + r)^2}; V_R^{FF} = \frac{\Phi^2}{16\beta(\delta + r)}G^{FF} + \frac{\Phi^4\gamma^2}{128kr\beta^2(\delta + r)^2}$$

(4) Total system profit

$$V^{FF} = \frac{3\Phi^2}{16\beta(\delta + r)}G^{FF} + \frac{\Phi^4\gamma^2}{64kr\beta^2(\delta + r)^2}$$

Property 1: When both parties are far-sighted, the sensitivity analysis of key exogenous variables yields the results presented in Proposition 1.

Table 1. Sensitivity analysis of key exogenous variables under FF model

	G^{FF}	ξ	θ	γ	β	δ	k
W^{FF}	$\nearrow$	$\nearrow$	$\nearrow$	$\nearrow$	$\searrow$	$\searrow$	$\searrow$
q^{FF}	$\nearrow$	$\nearrow$	$\nearrow$	$\nearrow$	$\searrow$	$\searrow$	$\searrow$
p^{FF}	$\nearrow$	$\nearrow$	$\nearrow$	$\nearrow$	$\searrow$	$\searrow$	$\searrow$
R^{FF}	$\nearrow$	$\nearrow$	$\nearrow$	$\nearrow$	$\searrow$	$\searrow$	$\searrow$
V_M^{FF}	$\nearrow$	$\nearrow$	$\nearrow$	$\nearrow$	$*$	$\searrow$	$\searrow$
V_R^{FF}	$\nearrow$	$\nearrow$	$\nearrow$	$\nearrow$	$*$	$\searrow$	$\searrow$

Note: In the table, $\nearrow$ denotes a positive correlation, $\searrow$ denotes a negative correlation, $\times$ denotes no correlation, and $*$ indicates the relationship with exogenous variables subject to the circumstances

Proof: To obtain the sensitivity analysis of key exogenous variables, calculate the partial derivative of the key parameters in the strategy. A positive result indicates a proportional relationship, while a negative result indicates an inverse relationship. If the key parameter is not included in the strategy, it is considered irrelevant. If the result is difficult to determine as positive or negative, it depends on the situation. Property 1 and Table 1 demonstrates that:

(1): As goodwill increases, both the green supplier and green retailer should raise their prices, leading to a positive cycle of increased profits for both parties.

(2): When the correlation between "reference price and brand goodwill" increases, i.e., when consumers rely more on brand goodwill when evaluating product prices, it urges green suppliers to improve their operational strategies (product quality and wholesale price), and green retailers will raise their retail prices accordingly, resulting in increased profits for both parties.

(3): As the influence of goodwill on market demand increases, it effectively stimulates the increase of market demand, motivating both green suppliers and green retailers to improve their strategies.

(4): The greater the influence of product quality on the evolution of brand goodwill, the greater the incentive for both companies to improve their strategies.

(5): The decay of goodwill weakens the strategies of the companies and leads to profit loss.

The above properties provide important management insights and suggestions. The importance of brand goodwill should always be considered, and companies should make the establishment and maintenance of brand goodwill a priority. Firstly, companies should create a good self-generated goodwill at the initial stage and widely publicize it in the early stage. Secondly, improving product quality and reducing the decay of brand goodwill are crucial for maintaining goodwill, so visionary companies should focus their strategies on investing in the quality level of their products. Additionally, companies should prioritize customers' feedback, enhance customer experience, develop reasonable and effective service standards (including pre-sales and after-sales service), continuously update products to improve goodwill, and promote a good customer reputation. Companies should take certain measures, such as providing reasonable after-sales service and conducting post-use satisfaction surveys of products, to maintain goodwill in a customer-centered manner. Green suppliers can improve the efficiency of their operations through technological innovation, regular employee training, regular machinery and equipment renewal, and forming alliances with raw material suppliers to establish collaborative relationships for the lowest cost.

4.2 Short-Sighted Green Suppliers and Short-Sighted Green Retailers (*MM*)

Proposition 2: In the *MM* mode, the Stackelberg differential game is

$$\max_{w(\cdot),q(\cdot)} \left\{ J_S^M = \left[w(t)[\Phi\sqrt{G(t)} - \beta p(t)] - \frac{1}{2}kq^2(t) \right] \right\}$$
$$\text{s.t. } \max_{p(\cdot)} \left\{ J_R^M = [[p(t) - w(t)][\Phi\sqrt{G(t)} - \beta p(t)]] \right\}$$

Based on the analysis using reverse induction in Stackelberg differential games, the following conclusions can be drawn:

(1) The strategies are

$$w^{MM} = \frac{\Phi\sqrt{G^{MM}}}{2\beta}; q^{MM} = 0; p^{MM} = \frac{3\Phi\sqrt{G^{MM}}}{4\beta}$$

(2) The time evolution paths of G^{FF} and R_p^{FF} are respectively

$$G^{MM} = G_0 e^{-\delta t}; R_p^{MM} = \xi\sqrt{G^{MM}}$$

(3) The profits of *S* and *R* are respectively

$$V_M^{MM} = \frac{\Phi^2}{8\beta r}G^{MM}; V_R^{MM} = \frac{\Phi^2}{16\beta r}G^{MM}$$

(4) Total system profit

$$V^{MM} = \frac{3\Phi^2}{16\beta r}G^{MM}$$

Property 2: When both parties are short-sighted, the sensitivity analysis of key exogenous variables yields the results presented in Proposition 2.

Proof: To obtain the sensitivity analysis of key exogenous variables, calculate the partial derivative of the key parameters in the strategy. A positive result indicates a proportional relationship, while a negative result indicates an inverse relationship. If the key parameter is not included in the strategy, it is considered irrelevant. If the result is difficult to determine as positive or negative, it depends on the situation.

Property 2 and Table 2 shows that:

(1): When both green companies are short-sighted, they ignore the impact of decisions on future benefits, and as a result, the most significant change in their decisions is that green suppliers choose to give up making quality level inputs. Therefore, the quality level is not affected by any exogenous variable, and the impact factor of quality level on brand goodwill and the cost coefficient of quality level do not affect the members' strategies and profits.

(2): Since both members only consider immediate interests and ignore the state evolution of goodwill, brand goodwill is only negatively influenced by the decay factor. Therefore, the reference price is not influenced by any variable other than goodwill, the influence factor of goodwill on the reference price, and the decay factor of goodwill.

Table 2. Sensitivity analysis of key exogenous variables under MM model

	G^{MM}	ξ	θ	γ	β	δ	k
w^{MM}	$\nearrow$	$\nearrow$	$\nearrow$	$\times$	$\searrow$	$\searrow$	$\times$
q^{MM}	$\times$	$\times$	$\times$	$\times$	$\times$	$\times$	$\times$
p^{MM}	$\nearrow$	$\nearrow$	$\nearrow$	$\times$	$\searrow$	$\searrow$	$\times$
R^{MM}	$\nearrow$	$\nearrow$	$\times$	$\times$	$\times$	$\searrow$	$\times$
$V_M{}^{MM}$	$\nearrow$	$\nearrow$	$\nearrow$	$\times$	$*$	$\searrow$	$\times$
$V_R{}^{MM}$	$\nearrow$	$\nearrow$	$\nearrow$	$\times$	$*$	$\searrow$	$\times$

Note: In the table, $\nearrow$ denotes a positive correlation, $\searrow$ denotes a negative correlation, $\times$ denotes no correlation, and $*$ indicates the relationship with exogenous variables subject to the circumstances

(3): The rest of the sensitivity analysis results are basically consistent with Property 1.

These results provide important management insights and suggestions. When both green suppliers and green retailers display short-sighted behavior, consumers rely more on current goodwill to judge the price of products. Therefore, it is particularly important to maintain brand goodwill. If the decay factor of goodwill is large, the investment in marketing strategy should be reduced accordingly to avoid unnecessary losses. Companies can build goodwill by establishing a green image of the company, performing system maintenance and product inspections to avoid inferior products, strengthening the quality and level of personnel to ensure the output of high-quality products, and regularly visiting customers to reduce consumer forgetfulness of the product.

5 Contrast Analysis

To investigate the membership strategies under two different behavioral patterns, this chapter uses steady-state solutions based on the previous theory and compares the size relationships.

Proposition 3: The relationship between the size of the product brand goodwill steady state under two different behavior patterns is

$$G_{\infty}^{FF} > G_{\infty}^{MM}$$

Proposition 3 shows that visionary behavior of green suppliers leads to higher brand goodwill. This indicates that the behavior pattern of e-commerce platforms does not significantly affect the brand goodwill of products, while the behavior pattern of suppliers plays a decisive role. When suppliers are far-sighted, they choose to invest in the quality of their products and focus on improving product quality. However, when they are short-sighted, they forgo investing in quality, and this has a negative impact on brand goodwill.

Proposition 4: The relationship between each steady-state strategy of green suppliers and green retailers are

$$w_{\infty}^{FF} > w_{\infty}^{MM}; q_{\infty}^{FF} > q_{\infty}^{MM}; p_{\infty}^{FF} > p_{\infty}^{MM}$$

Proposition 4 demonstrates that the steady-state strategies under the two different behavior patterns are positively influenced by goodwill. Therefore, the visionary behavior of green supply chain members can increase the level of each strategy, improve the efficiency of the entire supply chain in the operation and collaboration process, and increase performance. However, this can also exacerbate the double marginal effect. On the other hand, if green supply chain members display short-sighted behavior, the double marginal effect is delayed, but this results in consumers being faced with lower-quality products.

Proposition 5: Under two different behavior patterns, the supplier profit steady-state relationship is

$$V_{S\infty}^{FF} > V_{S\infty}^{MF}$$

Proposition 5 indicates that in the steady state, when both members of the green supply chain are far-sighted, the profit will be greater than the profit when both are short-sighted. Therefore, when making strategies, suppliers should consider the changes in profit in the present as well as the long-term profit after the decision is made. They should take visionary actions, make full use of all favorable resources to invest in the quality level, and establish the corporate purpose of producing high-quality and high-goodwill products.

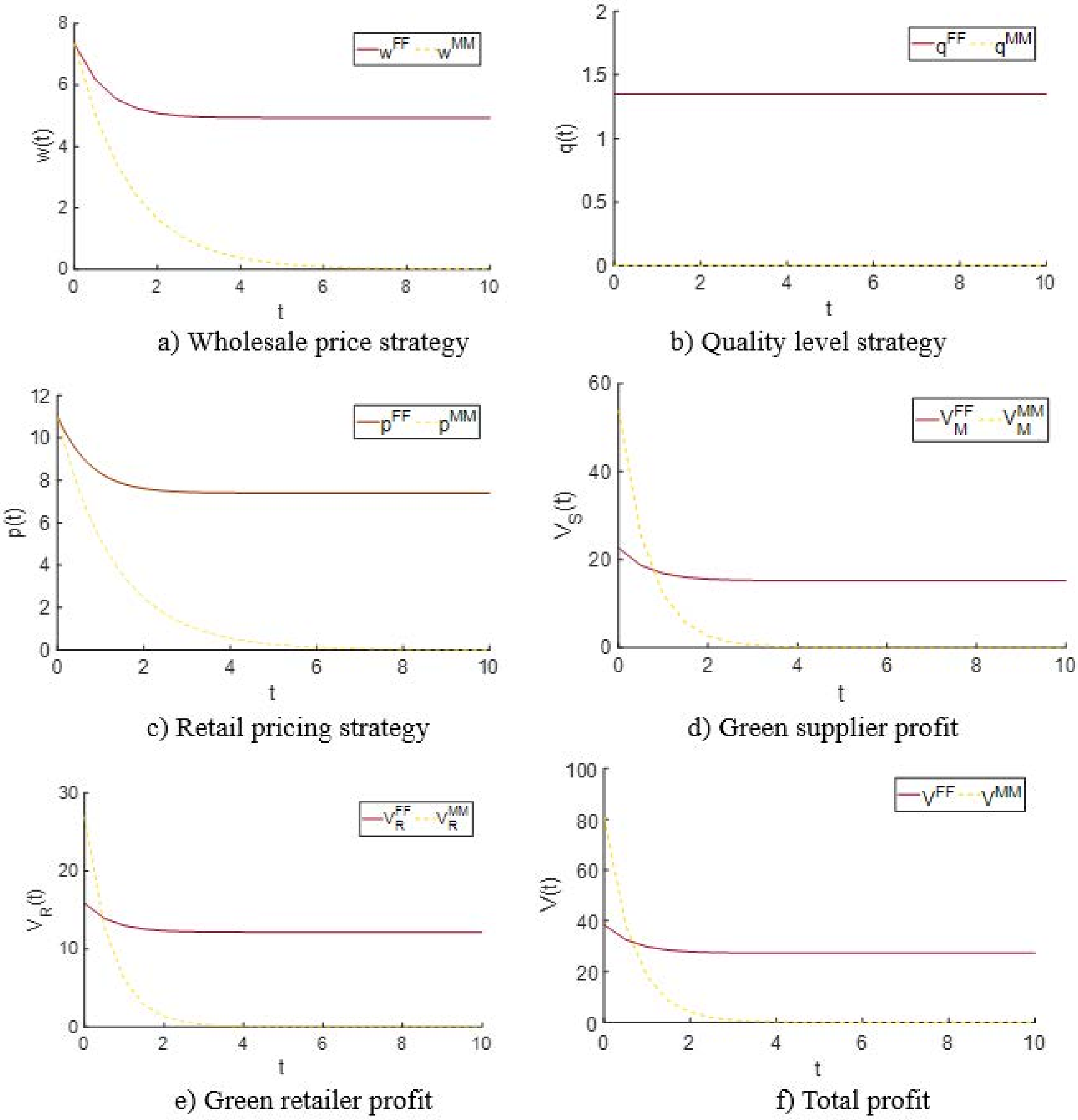

Figure 1. Time trajectory of each strategy and corporate profit for the two different behavioral models

6 Numerical Calculation Example

This section presents a graph showing the time trajectory of each strategy and corporate profits for the two different models.

The following observations can be made from Figure 1:

(1): Both members' strategies and firm profits are globally stable over time, which is consistent with the findings of the previous paper and provides support for the results of the previous steady-state analysis.

(2): The supply chain strategy depends on the behavior pattern of both supply chain members. When both members exhibit far-sighted behavior, the supply chain strategies are much higher than those when both members exhibit short-sighted behavior. This means a high wholesale quality and high selling price. In contrast, when both members of the supply chain exhibit short-sighted behavior, the strategies show the three low states of low wholesale, low quality, and low selling price.

(3): By observing subgraphs (d) to (f) of Figure 1, it can be seen that in the early stage, when both members of the green supply chain exhibit short-sighted behavior, the profits of green suppliers, green retailers, and total profits are significantly higher than the corresponding profits when both members exhibit far-sighted behavior. However, over time, profits gradually decline to a steady state. When the system reaches the steady state, it becomes clear that the steady-state value of profit is greater than the profit when both parties exhibit short-sighted behavior. This is true for both the profit of each supply chain member and the total profit of the system. Therefore, both parties exhibiting far-sighted behavior is a win-win strategy that can guarantee higher profits for themselves and the overall profit.

7 Conclusions

This study examines how the operational strategies and profits of green supply chain members can be influenced by their short-sighted and far-sighted behaviors, thereby affecting the efficiency and sustainability of green supply chains. The effects of reference price and demand change on the goodwill of green products are also considered to explore the formulation of operational strategies for supply chain members with different behavior patterns. Using differential game theory, models of green supplier far-sighted retailer far-sighted (FF) and green supplier short-sighted retailer short-sighted (MM) are established to analyze the evolution of brand goodwill, the level of each member's strategy, and corporate profits. Sensitivity analysis of key exogenous variables is conducted, and comparative analysis examines the steady-state magnitudes of members' strategies and profits under different behavioral patterns. Numerical calculations verify the previous propositions and inferences. The study concludes that: (1): Visionary behavior is preferred by consumers. Therefore, enterprises are recommended to prioritize far-sighted behavior when selecting their behavior patterns to meet consumer needs. (2): Both green suppliers and retailers will prefer far-sighted behavior to increase their own profits. (3): The far-sighted model is the optimal model combination for maximizing total profit of the green supply chain system. Therefore, members of the green supply chain are recommended to exhibit far-sighted behavior, taking into account both the interests of the enterprise and consumer rights.

In summary, as a leading supplier in the green supply chain, the supplier should utilize their leadership role to demonstrate visionary behavior by delivering higher quality and cost-effective products to the market. Paying attention to the establishment and maintenance of brand goodwill is crucial for driving the development of the enterprise and society and bringing higher profits for itself and downstream retailers. Retailers should also exhibit far-sighted behavior to increase their own profits. Therefore, both parties exhibiting far-sighted behavior is a win-win strategy that ensures higher profits for themselves and society, enhancing social welfare. Furthermore, future research can expand the selection of enterprise behavior models to other supply chains.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflict of interest.

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