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Research on Simple Game Behaviors among Subjects in the Green Logistics Field

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Abstract

The impact of logistics activities on the environment is becoming more and more obvious with the development of society and the economy, increasing the logistics flow. Meanwhile, the transformation of logistics management and the larger scale logistics equipment had a great influence on that. For instance, excessive vehicle transportation increases fuel consumption and road requirements. It results in the exhaust gas, noise, many other pollution and traffic jams; Excessive packaging and disposable packaging not only consume a lot of social resources but also generate a lot of waste, which has to be spent a lot of financial resources and labor resources go to recycling and processing. For realizing a symbiotic environment society, Green Logistics that can reduce the burden on the environment is an important and necessary part of the development model. The main purpose of this paper is to use the game theory model. The enterprises adopting green logistics are the core through the game behavior among various actors in order to find the internal interaction relationship. And then exploring the enterprises' economic benefits and relative effects corresponding to strategic choices by using green logistics under different circumstances. Providing a theoretical basis for follow-up research.

Keywords

Green Logistics, Economics, Game Theory, Government, Business, Consumer

1. Introduction

In modern society, consumers are becoming diverse in demands, coupled with more focus on personality and uniqueness. However, amid the constant improvement in consumption, the global environment is deteriorating. Thus, it is vital for the logistics field to alleviate the burden on the environment (Osuga,

2000). Green logistics can ease the above problem, make the best of resources, and is essential for the green development of each logistics link and related management (Toh, 1992). In logistics operation, green processing, packaging and transportation are indispensable. Green management, covering arterial logistics and vein logistics, aims at reducing negative impacts on the environment and saving resources as much as possible so as to improve the logistics system (Xiang, 2001). In addition, its final goal is stepping into the circular economy through achieving sustainable development and reaching the unification of the economy, society and environment (Xu, 2010). Thus, in view of the environment, improving the logistics management system and developing the green logistics model will define the future of logistics (Yu, 2006).

By analyzing behavior subjects in green logistics, the research clarifies the interrelation among objects and reveals the partial rationality and overall irrationality of their strategic choices through the game theory in economics, theoretically supporting the subsequent research on the development direction and promoting measures of green logistics, that is, the activities that behavior subjects should do and the corresponding ways.

The remainder of this paper is structured as follows: Section 2 illustrates the cognition and concept of green logistics in other countries. Section 3 focuses on the enterprises which use green logistics, using the game theory model to analyze the interaction relationship between different enterprises, enterprises and consumers, enterprises and governments. Studying the economic benefits and strategic choices of each subject, and finally get conclusions. Section 4 is the conclusion of this research. Section 5 is the insufficiency of this research and the direction of future supplementation.

2. Literature Review

2.1. The Concept of Green Logistics

Green logistics, a new field first mentioned by scholars in the 1980s and gradually developed in the 1990s, has yet to be unified by global scholars in terms of the special name for now. Although some scholars at home and abroad call it Environmental Logistics, Ecological Logistics or Green Logistics, the core remains a logistics system related to the environment. Meanwhile, owing to its non-uniform definition in academia worldwide, green logistics lacks a relatively sound research system (Zhou & Xu, 2017).

In *Green Logistics: Global Practices and their Implementation in Emerging Markets* mentioned that: Green logistics consists of all activities related to the eco-efficient management of the forward and reverse flows of products and information between the point of origin and the point of consumption, whose purpose is to meet or exceed customer demand. Given this definition, green logistics is not "new" in terms of re-inventing logistics, but it stresses the integration of ecological goals into the target systems of organizations and value chains in order to provide a balanced set of the total value to customers (Thiell, Zulua-

ga, Montañez, & van Hoof, 2001).

"Greenness" has become a code-word for a range of environmental concerns, and is usually considered positively. It is employed to suggest compatibility with the environment, and thus, like 'logistics' is something that is beneficial. When put together, the two words suggest an environmentally-friendly and efficient transport and distribution system (Rodrigue, Slack, & Comtois, 2001).

Green logistics is referred to as ecological logistics by the U.S. Reverse Logistics Executive Council (RLEC) in its study. It defined green logistics as the logistics operation of recognizing and minimizing the impacts on ecology and the environment (Brewer, Button, & Hensher, 2001).

Japan gave the definition in the *Manual of Enterprises Promoting Green Logistics from a CRS Perspective* formulated by the Ministry of Land, Infrastructure, Transport and Tourism in 2006 in the broad and narrow sense. In a narrow sense, green logistics refers to a logistic operation that can reduce greenhouse gas emission, especially carbon dioxide, from the perspective of abiding by the *Kyoto Protocol*. In a broad sense, generally, the objects of the "green" should also include NO_X, SO_X and PM. As to "logistics", it should be considered as a whole goods delivery system, rather than a narrow behavior, including systematical responses, talent cultivation, corporate efforts and symbiosis with the local community (Ministry of Land, Infrastructure, Transport and Tourism, 2006).

In 2001, the *National Standard Logistics Terminology of the People's Republic of China* (GB/T 18354-2001) noted that green logistics, called Environmental Logistics in English, refers to "a logistics operation that holds environmental harm from logistics, purifies the logistics environment and makes the best of logistics resources" (State Administration for Market Regulation & Standardization Administration of China, 2001).

2.2. Deficiency of Existing Research

There are few research results on green logistics, and there are more research results on reverse logistics and green supply chain management. Although these two aspects can be understood as the practice and intensive study of green logistics, the difference between them and green logistics is obvious. Among the limited research results of green logistics, most of them are based on the origin, development reasons, and related concepts of green logistics. Even if there is a small part of in-depth research, it is generally based on simple analysis based on questionnaires and statistical data, lacking the application of systematic methods and the depth of research. The purpose of this paper is to provide sufficient support for the research of green logistics from the perspective of economics.

3. Simple Game Behaviors among Subjects of Green Logistics

The independent pricing for self-made products (services) under the price strategy fails to enable the enterprise to internalize its external utility as the enter-

prise attempts to gamble on other behavior subjects, to tackle both the customer information asymmetry and the negative impacts of free-riding of other competitors (Gregory Mankiw, Liang, & Liang, 2020a, 2020b). In addition, because of the negative externality of the logistic industry, the whole society turns out to bear the costs, instead of the enterprise's direct assumption of its responsibility for the logistic operation impact and the environmental burden, which is accounted for the situation that more rapid development is accompanied with the worsening environment. Thus, it is imperative to explore a novel logistics model that can maximize the efficiency and minimize the negative impact of all logistic links on the environment (Okada, 2014). The green logistics is the right one to satisfy these requirements.

The author believes that an excellent solution to green logistics can only be found if enterprises, governments and consumers work together in the supply chain, instead of the individual effort. This chapter attempts to analyze the interrelation among enterprises and between enterprises and consumers/governments through the game theory, and explore the economic benefits of green logistics and corresponding strategies applied by enterprises in various situations.

Parameter setting:

p_i: Enterprises' logistics service prices; p_A is the price of enterprises adopting green logistics ("Enterprise A"), and p_B presents the price of enterprises without green logistics ("Enterprise B").

c_i: Enterprises' incremental costs; c_A and c_B present the incremental costs of Enterprise A and Enterprise B, respectively.

G: The grade of green logistics services from Enterprise A, namely the difference between Enterprise A and Enterprise B, $0 < G < 1$.

u_i: Consumption Utility, u_A presents the utility when consumers purchase green logistics products (services), while u_B is the utility when they purchase conventional logistics products (services).

When purchasing corporate conventional logistics products (services), the consumption utility is: $u_B = u - p_B$, u presents the maximum price accepted by consumers during the purchase. When purchasing corporate green logistics products (services), the excess utility of consumers, showed by aG, stems from the satisfaction and superiority after the purchase. In this case, the efficiency is: $u_A = u + aG - p_A$. If u_A is greater than u_B, consumers will decide to purchase green logistics products (services); if u_A is less than u_B, consumers will purchase corporate conventional logistics products (services); in the event of equality, consumers will make the decision at random.

3.1. Game Behaviors between Enterprises

The game theory model, whether enterprises adopt green logistics, is just like a prisoners' dilemma. In the absence of the oversight, incentives or investigations of governments, enterprises will adopt the strategies maximizing their interests after forecasting rivals' strategies (Rapoport, Chammah, Hirayama, Hiromatsu,

& Tatsuo, 1983). As a result, the Nash equilibrium sees the worst in overall utility (Siegfried, Lei, & Wei, 2011). The payoff matrix of game behaviors between enterprises is shown in **Table 1** below.

Hypothesis:

1) The two subjects in the game are unrelated enterprises in the logistics industry, belonging to two different types. Both are absolutely rational behavior subjects, targeting the maximization of interests of their respective enterprises.

2) Their strategies include the use and nonuse of green logistics.

3) The two subjects aim at maximizing respective interests based on the other's strategy, without the third party's influence such as oversight, incentives or investigations of governments. For the purpose of the following illustration, Enterprise A is assumed to select its strategy first; then Enterprise B makes strategy according to its estimates for the former's decision.

Matrix:

Case 1: If both Enterprise A and Enterprise B adopt green logistics at the same level, their profits are $p_A - c_A$, a normal level in the industry.

Case 2: If Enterprise A gives up green logistics, coupled with the use of Enterprise B, the logistics products (services) from two enterprises vary for consumers. Due to the information asymmetry and the absence of external assistance, consumers can only estimate whether an enterprise uses green logistics by virtue of their experience. If consumers harbor relatively negative attitudes or do not care about the enterprises' options of green logistics, and only buy cheap products (services). Profits gained by Enterprise A are $p_B - c_B$, a normal level in the industry. In contrast, profits of Enterprise B are $p_B - c_A$, lower than the average level in the industry ($c_A > c_B$, $(p_B - c_B) > (p_B - c_A)$). Thus, Enterprise B suffers a loss due to its option of green logistics.

Case 3: If Enterprise A adopts green logistics, coupled with the use of Enterprise B, the logistics products (services) from two enterprises vary for consumers. Due to the information asymmetry and the absence of external assistance, consumers can only estimate whether an enterprise uses green logistics by virtue of their experience. If consumers harbor relatively negative attitudes or care about the enterprises' options of green logistics, and only buy relatively high-price products (services). Profits gained by Enterprise A are $p_A - c_A$, a normal level in the industry. In contrast, the profits of Enterprise B are $p_A - c_B$, higher than the average level in the industry ($c_A > c_B$, $(p_A - c_B) > (p_A - c_A)$). Enterprise B will gain

Table 1. Game Behaviors between Enterprises.

Game strategies		Enterprise A	
		Adopted	Not adopted
Enterprise B	Adopted	1: $p_A - c_A$, $p_A - c_A$	2: $p_B - c_B$, $p_B - c_A$
	Not adopted	3: $p_A - c_A$, $p_A - c_B$	4: $p_B - c_B$, $p_B - c_B$

Source: own representation.

excess profits since it gives up green logistics.

Case 4: If Enterprise A and Enterprise B gives up green logistics. Their profits are the same, $p_B - c_B$, staying at a normal level in the industry.

Strategies:

Option1: If both enterprises adopt green logistics, their profits stay at a normal level in the industry, indicating that only if green logistics is discarded can an enterprise gain excess profits higher than the average in the industry. Thus, the most suitable strategy for Enterprise B is giving up green logistics.

Option2: In the event of Enterprise A giving up green logistics, Enterprise B's profits are lower than the average when it adopts green logistics. Only if it makes the same decision as Enterprise A, can it gain profits higher than the industrial average. Thus, the most suitable strategy for Enterprise B is adopting green logistics.

Therefore, whatever decision Enterprise A made, giving up green logistics can help Enterprise B maximize its interests. Because of the same situation as Enterprise B, Enterprise A faces the same choice. Therefore, giving up green logistics is a Nash equilibrium solution to the game behaviors of Enterprise A and Enterprise B.

Conclusion:

In the game behavior model of various enterprises, no matter which enterprise adopts green logistics, then it will give up due to the other's strategy. Thus, the Nash equilibrium solution will be the nonuse of green logistics for the two subjects. Reasons are as follows: 1) Most consumers fail to estimate the enterprises' option of green logistics on their own, coupled with information asymmetry; 2) In order for free-riding, enterprises that do not adopt green logistics may attempt to spread false information and propaganda, making the green logistics enterprises end up with elimination from the market.

3.2. Game Behaviors between Enterprises and Consumers

The green logistics model features a positive externality. If the externality is controlled internally by market mechanisms, the simplest solution is price variance. Enterprises can show the difference between the use and nonuse of green logistics by increasing the prices of logistics products (services).

But the matter is that most consumers fail to estimate the enterprises' options for green logistics on their own. If the logistics models of enterprises are distinguished by the prices, enterprises without green logistics can take advantage of the situation by changing their prices. As shown in Table 2, the balance of the free-riding can be presented by the payoff matrix between enterprises and consumers.

Hypothesis

1) Enterprises and consumers are the two subjects of the game's behavior. For consumers, the acceptable prices of logistics products (services) from green logistics enterprises are higher than those from enterprises without green logistics.

Table 2. Game behaviors between enterprises and consumers.

Game strategies		Enterprises	
		Adopted	Not adopted
Consumers	Purchase	1: $p_A - c_A$, $u_A - p_A$	2: $p_A - c_B$, $u_B - p_A$
	Refusal for purchase	3: 0, 0	4: $p_B - c_B$, $u_B - p_B$

Source: own representation.

Owing to their incapability to distinguish enterprises' options of green logistics on their own, consumers can only estimate an enterprise's logistics model through the prices. Meanwhile, the subjects' decision tends to be rational absolutely, presenting the pursuit for the maximization of self-interests.

2) Enterprises' strategies fall into two types: using or giving up green logistics. Consumers' strategies include: accepting the prices of corporate logistics products (services), namely purchase, and rejecting the prices, namely refusing for purchase.

3) Without external factors such as oversight, incentives and investigation of governments, the two subjects in the game select the strategies maximizing their interests based on the other's strategies.

Matrix:

Case 1: Assuming that consumers know the enterprises use green logistics, and actually the enterprises do it, c_A is the corporate costs, p_A is the purchased prices of green logistics products (services), u_A is the utility. The returns of consumers are $u_A - p_A$, and the profits of the enterprises are $p_A - c_A$.

Case 2: The enterprises without green logistics are assumed to make consumers believe its use through false propaganda, and raise the prices to p_A. According to the above hypothesis, consumers fail to distinguish on their own, and there is no external assistance. Then, the enterprises can achieve the free-riding without any additional costs. The returns of consumers are $u_B - p_A$, and the profits of the enterprises are $p_A - c_B$.

Case 3: In the event that the enterprises adopt green logistics, but consumers do not believe any propaganda from the enterprises and think the enterprises give up green logistics due to their incapability, p_A is the prices of green logistics products (services) of the enterprises. But only if the prices are p_B can consumers purchase the products (services). Thus, it is impossible for enterprises and consumers to trade in this case, and their returns are 0.

Case 4: In the event that consumers believe that the enterprises give up the green logistics, and actually the enterprises do it, p_B is the prices accepted by consumers to purchase logistics products (services), u_B is the utility acquired, and c_B is the corporate costs ($p_A > p_B$, $u_A > u_B$, $c_A > c_B$) The returns of consumers are $u_B - p_B$, and the profits of the enterprises are $p_B - c_B$.

Strategies:

If consumers opt to purchase the green logistics products (services) from enterprises, the optimum strategy of enterprises is discarding green logistics ($c_A >$

c_B, $(p_A - c_B) > (p_A - c_B)$). If consumers don't purchase the green logistics products (services) from enterprises, the optimum strategy of enterprises is discarding green logistics ($c_A > c_B$, $(p_A - c_B) > 0$). Therefore, whatever the consumers do, the optimum strategy for enterprises is giving up green logistics and achieving the free-riding in the event that consumers fail to distinguish on their own, and there is no external assistance. The green logistics enterprises in the market will finally give up due to the lack of rational profits.

Similarly, $p_A > p_B$, then $(u_B - p_B) > (u_B - p_A)$. For consumers, their optimal strategy is undoubtedly refusal to purchase fake green logistics products (services) from enterprises if they know the enterprises' choice of nonuse.

Therefore, the Nash equilibrium solution of their game is case 2; that is, consumers do not purchase logistics products (services) from enterprises, and the enterprises discard green logistics. Finally, enterprises have no reason to adopt green logistics, and consumers lack the impetus to help enterprises with the adoption.

Conclusion:

If consumers have no intention to bear the costs, time and energy to understand green logistics, and believe that the prices can accurately reflect the enterprises' options. Finally, all enterprises will give up green logistics for their costs and profits considerations. In addition, governments need more additional costs to solve the problems in the development of the logistics industry, environmental protection and pollution control, social and economic growth and otherwise.

3.3. Game Behaviors between Enterprises and Governments

Due to the positive externality of green logistics, the enterprises discarding green logistics are more than those adopting green logistics in terms of the environmental burden from enterprises. Based on this, governments representing the interests of the country as a whole should never get around the problem.

Hypothesis:

1) Governments and enterprises, the two subjects in these game behaviors, make strategies with absolutely rational thinking, namely maximization of their interests.

2) For enterprises, the strategies include two types: adopting or giving up green logistics. For governments, the strategies include surveying or giving up the survey for enterprises' options.

3) When they make strategies, they do not understand the other's decisions; that is, they do it at the same time. But each subject knows all the other's choices. In other words, this game behavior model is completely an information game.

Parameter setting:

e_A: Profits gained by enterprises when they adopt green logistics.

e_B: Profits gained by enterprises when they give up green logistics. According to the above game analysis results, enterprises without green logistics can gain more profits higher than the average in the industry, namely excess profits, thus $e_A < e_B$.

F: The enterprise will be penalized for not adopting green logistics when investigated by government regulators. The level of penalties (fines) must exceed the enterprise's excess profits as a result ($e = e_B - e_A$, $(e_B - e_A) < F$). Otherwise, the enterprises will lose the incentive to adopt green logistics even if they are aware that the government will conduct relevant inspections (($e_B - F$)< $e_A < e_B$).

C: The cost for the government to investigate the enterprises, including the total expense of building specialized regulators, hiring full-time investigators, and purchasing related technical equipment. Since the government is also assumed to be absolutely rational, the total expense to investigate the enterprise must be less than the penalty levied on the enterprise for not adopting green logistics, that is, $C < F$. Otherwise, government regulators will lose the incentive to conduct investigations.

π_g: Expected government revenue

π_e: Expected enterprise income

According to the above assumptions and parameters, the game behaviors between enterprise and government are shown in Table 3.

Matrix:

Case 1: If the government investigates the enterprise, while the enterprise adopts green logistics, the enterprise can get the profit e_A; however, the government does not receive penalty income in this investigation, and also pays a cost C, so the final benefit for the government is $(-C)$ that is, the government is in a deficit position.

Case 2: If the government investigates the enterprise, while the enterprise gives up green logistics, the enterprise will be subject to a fine of F from the government regulators, and the penalty is also the revenue for the government. The government revenue is $(F - C)$. The enterprise has to pay the penalty for giving up green logistics, so the final profit will be $(e_B - F)$, which is definitely lower than e_B.

Case 3: If the government doesn't investigate the enterprise, but the enterprise adopts green logistics, so the government has no penalty income and no investigation cost, and the revenue is zero. e_A represents profits gained by enterprises when they adopt green logistics.

Case 4: If the government doesn't investigate the enterprise, and the enterprise adopts green logistics, so the government has no penalty income and no investigation cost, and the revenue is zero. The enterprise profit is e_B if it adopts green logistics.

Table 3. Game behaviors between enterprises and governments.

Game strategies		Enterprises	
		Adopted	Not adopted
Government	Investigate	1: $(-C)$, e_A	2: $F - C$, $e_B - F$
	Not investigate	3: 0, e_A	4: 0, e_B

Source: own representation.

Strategies:

From the above analysis, the game behaviors between the enterprise and the government do not support the Nash equilibrium solution in view of pure strategy. If the government investigates the enterprise, and the enterprise will adopt green logistics because of $(e_B - F) < e_A$. If the government doesn't investigate the enterprise, the enterprise will give up green logistics because of $e_A < e_B$. Similarly, if the enterprise adopts green logistics, the best strategy for the government is to not investigate since $(-C) < 0 < C$. The enterprise gives up green logistics because of $C < F$, $0 < (F - C)$, so that the best strategy for the government is to "investigate". Therefore, the enterprise and the government can't agree on the interests. In any pure strategy combination, the subjects can change their strategies independently and try to maximize benefits. Therefore, the game behaviors between the enterprise and the government is completely a mixed strategy.

Because there is no Nash equilibrium solution of pure strategy for the game behaviors between the government and the enterprise, the mixed strategy model shall be introduced to deal with that. The government is unlikely to investigate every enterprise, so some enterprises must believe there would be a fluke.

Let's assume that the probability of the government investigation is $x\,(0 < x < 1)$, the probability of the enterprise adopting the green logistics is $y\,(0 < y < 1)$.

Then calculate the expected revenue of the government and the enterprise respectively as follows:

1) If the government investigates enterprises' options for green logistics, the expected revenue of the government π_{g1} is:

$$y(-C)+(F-C)(1-y)$$

2) If the government gives up investigating enterprises' options of green logistics, the expected revenue of the government π_{g2} is:

$$0\times y+0\times(1-y)$$

The expected revenue of the above two cases is:

$$y(-C)+(F-C)(1-y)=0 \Rightarrow y=\frac{F-C}{F}$$

3) If the enterprise adopts green logistics

The expected revenue of the government π_{e1} is $xe_A+(1-x)e_A=e_A$.

4) If the enterprise gives up green logistics

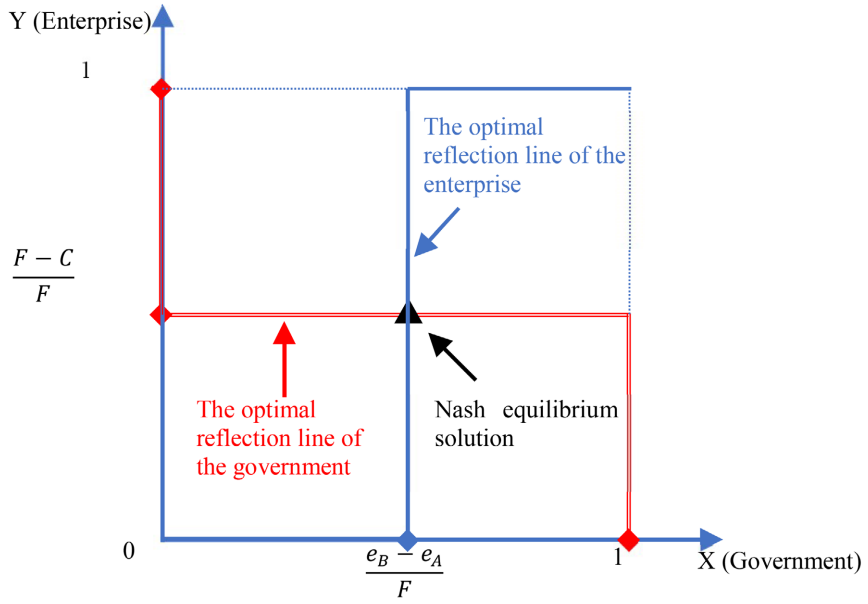
The expected revenue of the enterprise π_{e2} is: $x(e_B-F)+(1-x)e_B=e_B-Fx$.

The expected revenue of the above cases is:

$$e_A=e_B-Fx \Rightarrow x=\frac{e_B-e_A}{F}$$

Therefore, in view of the mixed strategy, the Nash equilibrium solution of the game behaviors between the government and the enterprise is (**Figure 1**):

$$\gamma_{\text{Enterprises}}=\left(\frac{F-C}{F},\frac{C}{F}\right)$$



Source: own representation.

Figure 1. A mixed strategy nash equilibrium solution for the game behaviors between the enterprise and the government.

$$\gamma_{\text{Government}} = \left(\frac{e_B - e_A}{F}, \frac{F - e_B + e_A}{F} \right)$$

$$(x, y) = \left(\frac{e_B - e_A}{F}, \frac{F - C}{F} \right)$$

Conclusion:

1) In view of pure strategy, there is no Nash equilibrium for the game behaviors between the government and the enterprise, but there is a Nash equilibrium solution from the perspective of mixed strategy: $(x, y) = \left(\frac{e_B - e_A}{F}, \frac{F - C}{F} \right)$.

2) The relationship between y and F is positive, which means that the greater the penalty amount set by the government for the enterprises' option of green logistics, the greater the probability of the enterprise "adopting" green logistics model.

3) When $0 < x < \frac{e_B - e_A}{F}$, the optimal strategy for the enterprise is giving up green logistics if it wants to maximize its interests. When $\frac{e_B - e_A}{F} < x < 1$, the optimal strategy for the enterprise is adopting green logistics if it wants to maximize its interests.

4. Summary

The purpose of this research is to analyze and illustrate the results of the enterprise to adopt green logistics from three aspects of the enterprise, government and consumer, and the optimal strategy of the enterprise under different cir-

cumstances.

Firstly, this article, based on the existing theories of green logistics in academic circles, introduces the scope of green logistics and its knowledge level in various countries, and the significance of developing green logistics, and deduces that it is not realistic to implement green logistics only by enterprises. Enterprises, governments, and consumers are all essential subjects in promoting the development of green logistics and are also important components in helping the introduction of green logistics systems in enterprises and implementing the ideological model of green logistics in society.

In this article, through the knowledge of game theory in the field of economics, we analyze the models of the three main subjects of enterprise & consumer, inter-enterprise, enterprise & government, and draw conclusions, respectively. In the game models of enterprise & consumer and inter-enterprise, the Nash equilibrium solution exists, and the result is that the enterprise gives up green logistics. In the game between the enterprise and the government, there is no Nash equilibrium solution in view of pure strategy. The Nash equilibrium solution of mixed strategy shows that the enterprises' option of green logistics roots in the level of the government punishment and oversight or investigations for enterprises not adopting green logistics.

In general, judging from the economic standpoint alone, the enterprise using the green logistics model is not only unlikely to get excess profit, even normal profit. For business operators, adopting green logistics can only be detrimental to their interests, so it is obviously unwise to adopt green logistics. However, from the perspective of long-term development, the choice to develop green logistics is inevitable for the enterprise. Firstly, it helps the enterprise to establish a good reputation and improve its market value, which may help development and profit growth. Secondly, we believe that the industries related to sustainability will certainly have a bright future. As an essential part of promoting a circular economy, green logistics will certainly attract great attention and get significant support from all circles.

5. Future Issues

1) This article only researches and draws conclusions on green logistics subjects from the perspective of game theory, and the method used here is only a small part of many economic theories, which cannot represent the theoretical results or corresponding research results under all game theory models.

2) The individual conclusions and the overall conclusion of this article are purely theoretical and are only the result of the analysis from the economics perspective by using the economics method. In today's social economy, there are many external factors, so the conclusions cannot fully reflect all the obstacles in the process of promoting green logistics, so it is necessary to make further analysis considering different national conditions, different enterprise types and the current situation of logistics.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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