

## Supply Chain's Market Entering Strategy with Unbalanced Power

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### Abstract

*In this Internet age, global economic integration process increases fierce market competition. In addition to dealing with issues such as geography, culture, technology, knowledge, and close relations of cooperation between enterprises, the enterprises also expanded the scope and space of the competition among enterprises. Market becomes more crowded. At the same time, customer demand over the past simple quality, cost-effective, and after-sales service is quite different; companies need to provide timely quality assurance while meeting the special needs of customers personalized products and services. Therefore, businesses have to cost reduction even more responsive to changes in product demand, distribution and more rapid, more comprehensive service. View the extensive literature on the basis on the powers of the supply chain not including retailers accounted for the dominant and supplier account issues such as the dominant narrative. The introduction of the binary value of the structure, functions can be summarized in the market acceptance of products in use function and enjoyment features. Use features can be known as the basic value, determined by the substitution effect of satisfaction; enjoyment from beyond the performance of an enjoyment features, can be described as beyond the value of the product to meet consumer satisfaction of the fashion and goods function. Market access that is, supply chain ranging from power problems, functions and enjoy the functionality requirements, constraints, where quality and service, and is proportional to the level of product quality and service, the same external coefficient between products, in order to determine the market of product differentiation positioning, companies need to consider the results of price competition, the use of backward induction, first obtain the equilibrium solution of the price competition in the Stackelberg equilibrium, and then get the enterprise product differentiation and positioning strategy.*

**Keywords:** Supply chain power; Multi-dimensional utility; Market entry; Stackelberg equilibrium

### 1. Introduction

In this Internet age, global economic integration process, the increasingly fierce market competition. In addition to dealing with issues such as geography, culture, technology, knowledge, and close relations of cooperation between enterprises, the enterprises also expanded the scope and space of the competition among enterprises. Market is becoming increasingly crowded. At the same time, customer demand over the past simple quality, cost-effective, and after-sales service is quite different; companies need to provide timely quality assurance while meeting the special needs of customers personalized products and services. Therefore, businesses have to cost reduction even more responsive to changes in product demand, distribution and more rapid, more comprehensive service.

Generally speaking, the power of the enterprise of cooperative relation in the supply chain is difference. When both parties have dependence relation, the core member usually owns more powers and they can seek more benefits by the power. The simple supply chain structure includes retailer and manufacturer, therefore there are two kinds of circumstances in the supply chain that retailer predominate the position and manufacturer predominate the position. Now, the retailer and manufacturer reach the consensus of common profits gradually. Retailer cooperating with manufacturer the supply chain better, and make the total profits in the supply chain raise, both sides benefit.

Competition between the different right structure supply chains didn't be enough valued, but the power structure has an important influence on profits allotment, fixed price and stock decision of supply chain member. Competition between the supply chains, forces internal structure of supply chain continuously perfect, the inner member cooperates unanimously and outward, each constituent part specify strategy under the condition of the competition part, thus improving the competition ability of the whole supply chain. Existing research on the system of the competition between supply chains is still not enough perfect, to the supply chain manage mostly is internal supply chain problem, the problem between the supply chains also limits to regard the supply chain as the whole.

According to existing literature, the foreign existing achievement can be divided into:(1)The competition of introducing product differentiation;(2)The competition of two supply chains that base on the level of customer service;(3)The competition in the supply chain network, the competition structure of the supply chain is more complicated. Two supply chains are crossed and make competitive structure appear the network form, or a supply chain have already formed the network, Some scholars research on the competitive structure from the perspective of game theory, and some scholars explore the problem from the perspective of cam;(4) The competition behavior in the supply chain individual layers, studying stock and existence and service competition.

This paper studies the strategy to enter the market under the power asymmetry of supply chain. Market access namely the supply chain between the powers of unequal problems, to use function with enjoy the request of function. Here the constraint for the quality and service, and the quality of the products and the service level are proportional, product external coefficient are same. In order to determine the market positioning of product differentiation, the enterprise needs to consider the result of price's competition, therefore using backward induction get the balanced solution of the price competition Stackelberg game first, then get the difference between enterprise product positioning strategy.

Firstly, analysis the supply chain power problem, it includes the retailer predominates in the supply chain, how does the retailer improve profit, how does the manufacturer set homologous strategy *etc.* The manufacturer predominates in the supply chain, how does the manufacturer improve profit, how does the retailer set homologous strategy *etc.* The price competition of brand difference, Brand difference through the linear demand function reflect and how does the parameter respond the brand difference; The binary value structure can generalize for the using function and enjoying function on the function in the product that the market approves, using function can be called the basic value function of product, the substitution effect determine the actual demand satisfaction. Enjoying function is a type of enjoyed function that comes from outstripping to use function, and can be called an outstripping of product to be worth of function. To meet the consumer satisfaction and consumer grade fashion, the different function difference of the product, cause consumer's hobby different, therefore the need is different.

Analysis on market access issues, there are two quality and service level are different products 1 and 2 products, 2 products quality and service level is higher than 1. Suppose 1 or 2 already in the market, to correspond of 2 or 1 the price, share and profits analysis of market, can analyze market access, quality and service level is lower or higher more

reasonable.

## 2 Problem Analysis

### 2.1 Research on Retailers-Dominant Supply Chain

In accordance with the Organization for Economic Cooperation and Development (OECD) definition of retailers' buyer's market power, if a retailer is able to take action to at least one supplier and make long-term losses in proportion to the supplier clearly outweigh the losses to him, then we can say the retailer has a buyer's market power. If the retailer stops providing products to a supplier and thus made the supplier's profit fell by 10%, while his own profits fell only by 0.1%, then the retailer has a strong buyer's market power.

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Retailers and suppliers are different participants in the supply chain. The reason why retailers plays a dominant role is that suppliers rely on their selling resources, which include product demand information, quantity of procurement, differential services and brand *etc.*

On the basis of Potter's definition of Retailer Power, it is the retailer that influences the product diversity of a supplier. He confirmed the existence of Retailer Power, and found that the Retailer's Bargaining Power rises when it has some impact on the product differentiation of some other members of the supply chain [1].

According to the existed researches, when the number of retailers decreases, the dominant retailers have countervailing power to the manufacturers, and they also have monopoly power to consumers [2]. Due to the increased retail market concentration, the retail price changes and it reflects the joint effect of countervailing power and monopoly power.

In supply chain cooperation, manufacturers and retailers are studying Nash bargaining model profit sharing mechanism [3]. Retail price changes due to concentration of retail markets reflect the joint effect of downstream countervailing power and upstream monopoly power. The competitors of suppliers and downstream retailers are taken into consideration. And based on various fee contracts, retailers who is led by downstream countervailing power model get lower wholesale price and more profit from its manufacturer by taking the advantage of its power. Moreover, to analyze how to decide the slotting allowance in the two stages of retailers-dominate supply chain by Stackelberg game theory, and by introducing slotting allowance decision-making factor to analyze the retailers' charges on suppliers, we can come to the conclusion that retail price is strongly relied on the wholesale price of suppliers [4]. Based on the two-stage supply chain system, and uncertainty of the Manufacturer's cost, the dominant retailers should choose a good strategy, how to choose Manufacturer Stackelberg and Retailer Stackelberg to maximize his profit [5].

Gaski for distribution channel for many kinds of definition about power of the channel member, and gives five common power manifestation: price, orders, scheduling, inventory, product portfolio and customer service [7]. El Ansary and Stern, The strength of The Channel Member (The Power of The Channel Member) is defined as "a Channel Member to control The other Channel Member in The marketing strategy decision

variables" in [8]. These variables include: inventory strategy, order quantity, price, promotion, cooperation, distribution, advertising, distribution, reputation, quality of installation work, sales staff, sales meetings, service areas, and professional organizations to participate in the 13 types of decision variables.

Under the circumstance of imbalanced power in the supply chain, the dominant retailer can improve its profit and coordinate its channels by price and quantity discount strategy under the information structure of incentive strategy. In the same supply chain, the escalation between interrelated retailers and manufacturers will reduce the efficiency of the supply chain. As a result, the cooperation will increase both sides' shared profits, and can optimize the whole supply chain in a long term.

## **2.2. Research on Manufacturers-Dominant Supply Chain**

In the monopoly or oligopoly market, the manufacturer can charge prices above the competitive price and thus established its leading position, the manufacturer to retailer has monopoly power and negotiation skills, the retailer intermediary was transferred to consumer goods manufacturers. Therefore, the retailer can only passively accept the wholesale price of the supplier, the optimal decision of the hypothesis and study the overall supply chain optimization and the retailer and the supplier. [1] In the two stage the newsboy problem in production system, the manufacturer and the retailer must make decisions.[2] In addition to the wholesale price, manufacturer's second decision variables is not selling products decision. Fixed market retail price is determined, the retailer's profit increases with demand uncertainty. Scholars use Stackelberg differential game in the dynamic case considering inventory, the wholesale price, retail price and the external environment factor in the supply chain application of various models.

Another study the information sharing mechanism of the upstream enterprises in the monopoly market:(1) the upstream enterprise according to the prior information only on the intermediate transfer price information sharing mechanism agreed; (2) the upstream enterprises according to the price of experimental information on the intermediate transfer price and the downstream enterprises purchase quantity information sharing mechanism agreed. Compare the two cases that can't share information and information sharing between performances. [3] Manufacturers can specify reasonable prices and adopt appropriate incentives motivate distributors and obtain the real marketing information, and take the optimal production decision by using these information. The manufacturers single wholesale to the retailer only get a profit of production; and retailers together sales, can benefit in marketing channel; And retailers together sales, can benefit in marketing channel.

## **2.3. Different Brand Price Competition**

Generally speaking, different supply chain sales of products is different, a lot of supply chain leaders are upstream enterprise, these enterprise are generally large manufacturers, such as Haier, Changhong, Siemens, Sony, Philips. Under the iPhone, Nokia, Samsung, Sony Ericsson Occupy mobile phone most of the cases market share, Millet mobile phone has also entered the consumers, in the brand differences, how to meet consumer demand through the pricing strategy, difference strategy to win customer recognition and then entered the market, taking some market share, to analyze the price strategy. Here will use the linear model to analysis the influence of brand difference of price demand.

## **2.4. Model Assumptions**

There are two symmetrical structure of the supply chain model, each supply chain composed of a manufacturer and a retailer, two enterprises were 1 and 2 with the code;

In each supply chain, the manufacturer is the core of the enterprise; the supply chain management is centralized control. Centralized control means the manufacturer full

control of the retailer by way of holding and acquisition, the retailer don't have pricing power.

Assuming that the manufacturer does not have fixed costs, production cost per unit is the same; the retailers do not have the cost of sales, there is only product purchase cost, the purchase cost is the manufacturer's wholesale price;

Market demand is determined by the deterministic demand function, and assuming that the production capacity is unlimited, and there isn't shortages.

Each supply chain members have the complete information of the demand function and the manufacturer's production costs.

Product of supply chain 1 is the new entry into the market; Product of supply chain 2 have a certain position in the market and a large market share.

Assuming that the supply chain retailers face market demand is linear

$$q_i = a - bp_i + cp_{3-i} \quad i=1,2 \quad (1)$$

$q_i$  is the demand for products 1,  $p_i$  and  $p_{3-i}$  respectively, the retail price of the product. For retailers in supply chain 1,  $p_i$  the higher the price, the customer demand for its products is smaller, the competitor's product pricing higher  $p_2$ , customer demand for more. Parameters meet the  $a>0$ ,  $b>c>0$ .  $b$  reflects the impact of price  $p_i$  on demand brand, the price rises of the same,  $b$  is greater price rises by the same magnitude of reduced demand more reflects the degree of  $i$  needs another supply chain product sales price of brand  $p_{3-i}$ ,  $C$  higher price rises by the same magnitude of  $p_{3-i}$  demand for the  $I$  brand is stronger.  $b-c$  is the difference between two kinds of brand. The smaller the  $b-c$ , the difference between the two kinds of frequency offset is not obvious, can replace the stronger; and the difference between the two kinds of brand is greater, alternative weaker.

## 2.5. The Binary Value Structure

Consumers enjoy the basic function of product and satisfied, then have a high grade value pursuit, and is willing to pay the deemed worthy and can bear the cost, so the modern enterprises need to establish a new manufacturing philosophy. The enterprise should from product design, in all links of production, sales and service, with different levels to meet consumer demand for the principle of two levels, the so-called technical economy should not be used as product manufacturing principles, but only as a means, the main or important methods. Practice has proved, any product made by manufacturer, it is because of the different degree with two kinds of value function can be a foothold in the market; In turn, who according to consumer demand to varying degrees, provides two kinds of value function of the product can participate in the competition and the sale of two kinds of value functions with the property market and competition ability the products of the enterprise, is necessary and sufficient, shall be used as the manufacturing and sales of modern product design, principle although consumption beyond value differ from man to man, and the differences may be great, but to pay a small fee with many people, but there are plenty of people who are willing to pay high fees, the latter is in the whole society is one of the few however, according to the Pareto effect, most of them have the wealth of society, it is the orientation and the mainstream of social consumption. As long as the enterprises from the essence, the development vision of the reality of consumer preferences, will consciously accept The binary value theory and the corresponding concept of consumption.

The reality of the consumer concept has not completely focused on economic benefits, but pay attention to economic benefits, even to accept the high prices, more and more attention to the additional features and psychological satisfaction represented by brand benefit. In the market acceptance of products can be summarized as the using function and enjoying function.

Use features can be known as the basic value, determined by the substitution effect of

satisfaction; enjoyment from beyond the performance of an enjoyment features, can be described as beyond the value of the product to meet consumerbit of the satisfaction of the consumer fashion and consumer goods. these make the reality of consumption has changed into the binary value structure, with U expressed in units of products to provide consumers with the utility, the two-dimensional structure characteristics satisfy linear complementarity. In the exclusion by the makers of advertising and other promotional caused by emotional conditions, product utility is equal to

$$U_i = w_1 E_i + w_2 V_i \quad (2)$$

Where  $w_1$  and  $w_2$  represent two kinds of attribute weights are, in the minds of consumers, so  $w_1, w_2$  nonnegative and satisfy

$$w_1 + w_2 = 1 \quad (3)$$

The  $\lambda$  represent consumption perfect expected value of unit product, then consumers to buy the product price P meet

$$\lambda U - P \geq 0 \quad (4)$$

The consumer has become buyers.

Unit product of enterprise 1 provide users with two kinds of value function, the corresponding utility enterprise 2 is  $E_2$  and  $V_2$ ; So total utility of two to provide for client is  $U_1 = w_1 E_1 + w_2 V_1$  and  $U_2 = w_1 E_2 + w_2 V_2$ . Set the product price in the market is  $P_1$  and  $P_2$ , so the necessary and sufficient conditions of client purchasing product of enterprise 1 is  $\lambda U_1 - P_1 > \lambda U_2 - P_2$ , purchasing product of enterprise 2 is  $\lambda U_1 - P_1 < \lambda U_2 - P_2$ ; When  $\lambda U_1 - P_1 = \lambda U_2 - P_2$ , consumers to buy a product without bias. Bring  $w_1 = 1 - w_2$  to

$$w_0 = \frac{\lambda(V_2 - V_1) + (P_1 - P_2)}{\lambda[(V_2 - V_1) + (E_1 - E_2)]} \quad (5)$$

Obviously, in  $(V_2 - V_1) + (E_1 - E_2) > 0$  conditions, consumer whose preferences satisfy  $w_1 > w_0$  consumers belong to the buyers of enterprise 1, and its product quality is better; and those enterprises who meet  $w_1 < w_0$  belonging to 2 buyers, the service of enterprise 2 is better. When  $(V_2 - V_1) + (E_1 - E_2) < 0$ , the above inequality changes.

### 3. Solving the Model

#### 3.1. Model Assumptions

Suppose there are two enterprises, respectively, providing the market with different quality and service level of product 1 and 2, quality level is  $E_i$ , assume  $E_1 < E_2 < 2E_1$ , service level is  $V_i$  (in order to simplify the calculation assumes that the  $V_i$  meeting  $V_i = E_i$ ,  $i=1,2$ ; Customers on product quality service level demand ratio is 2:1, assume that the two products of externality coefficients equal) the price of product is  $P_i$ . The definition of consumer utility function  $U_i$  ( $i=1,2$ ) for

$$U_i = 2kE_i + 2\alpha kE_i Q_i + kV_i + \alpha kV_i Q_i - P_i \quad \text{即} \quad U_i = 3kE_i + 3\alpha kE_i Q_i - P_i \quad (6)$$

Where  $k \in [0,1]$ , consumer preference parameters is  $\theta = 3k$ , and then  $U_i = \theta E_i + \alpha E_i Q_i - P_i$

In the equation, parameter  $\alpha$  represents the external factor, with the increase of  $\alpha$ , the utility of quality service and demand service product quantity impact on consumer increases; Assume the market is the ideal market [1], namely The size of the market and consumer expectations are consistent, Assume consumers' utility function is always positive.

In order to determine the product differentiation market positioning, enterprises need to consider the price competition, so using backward induction method, get the equilibrium

of price competition Stackelberg game, and then get the enterprise product differentiation positioning strategy.

$$U_1 = U_2 \text{ 时, } \theta_0 = \frac{P_2 - P_1 - \alpha E_2}{(1 - \alpha) E_2 - (1 + \alpha) E_1} \quad (7)$$

So the two products market share and profit are

$$\begin{aligned} Q_1 &= \theta_0 \\ Q_2 &= 1 - \theta_0 = \frac{E_2 - (1 + \alpha) E_1 - P_2 + P_1}{(1 - \alpha) E_2 - (1 + \alpha) E_1} \\ \pi_1 &= P_1 Q_1 - C_1 = \frac{P_1 (P_2 - P_1 - \alpha E_2)}{(1 - \alpha) E_2 - (1 + \alpha) E_1} - C_1 \\ \pi_2 &= P_2 Q_2 - C_2 = \frac{P_2 [E_2 - (1 + \alpha) E_1 - P_2 + P_1]}{(1 - \alpha) E_2 - (1 + \alpha) E_1} - C_2 \end{aligned} \quad (8)$$

### 3.2. Solving the Model

#### 3.2.1. Nash Game Market Entry Decision

Two products enter the market at the same time. In the Nash game, assume that each operator for the optimal decision-making on the optimal decision, by using the profit function first-order conditions get Nash equilibrium for two products:

$$\begin{aligned} \bar{p}_1 &= \frac{(1 - 2\alpha) E_2 - (1 + \alpha) E_1}{3} \\ \bar{p}_2 &= \frac{(2 - \alpha) E_2 - 2(1 + \alpha) E_1}{3} \end{aligned} \quad (9)$$

Equilibrium market share is

$$\begin{aligned} \bar{Q}_1 &= \frac{(1 - 2\alpha) E_2 - (1 + \alpha) E_1}{3 [(1 - \alpha) E_2 - (1 + \alpha) E_1]} \\ \bar{Q}_2 &= \frac{(2 - \alpha) E_2 - 2(1 + \alpha) E_1}{3 [(1 - \alpha) E_2 - (1 + \alpha) E_1]} \end{aligned} \quad (10)$$

Equilibrium market profit is

$$\begin{aligned} \bar{\pi}_1 &= \frac{[(1 - 2\alpha) E_2 - (1 + \alpha) E_1]^2}{9 [(1 - \alpha) E_2 - (1 + \alpha) E_1]} - C_1 \\ \bar{\pi}_2 &= \frac{[(2 - \alpha) E_2 - 2(1 + \alpha) E_1]^2}{9 [(1 - \alpha) E_2 - (1 + \alpha) E_1]} - C_2 \end{aligned} \quad (11)$$

The product price, share is positive, there is

$$\begin{aligned} (2 - \alpha) E_2 - 2(1 + \alpha) E_1 &> 0 \\ (1 - \alpha) E_2 - (1 + \alpha) E_1 &> 0 \\ (1 - 2\alpha) E_2 - (1 + \alpha) E_1 &> 0 \end{aligned} \quad (12)$$

And  $0 < \alpha < 1, E_2 > E_1$ , there is

$$\begin{aligned} \bar{p}_2 - \bar{p}_1 &= \frac{(1+\alpha)(E_2 - E_1)}{3} > 0 \\ \bar{Q}_2 - \bar{Q}_1 &= \frac{(1-2\alpha)(E_2 - E_1)}{3[(1-\alpha)E_2 - (1+\alpha)E_1]} > 0 \end{aligned} \quad (13)$$

### 3.2.2 Game of Market Entry Strategies

(1) Product 2 come into the product 1 market

Stackbelberg game that product 2 comes into product 1 market, adopt the method of backstepping, by using providing product 2 the first-order condition profit function to get

$$P_2^1 = \frac{E_2 - (1+\alpha)E_1 + P_1^1}{2} \quad (14)$$

Put the equation into the profit function of product 1, then using the first-order conditions obtained optimal market price of product 1:

$$P_1^1 = \frac{(1-2\alpha)E_2 - (1+\alpha)E_1}{2} \quad (15)$$

Therefore we can get optimal product 2 price

$$P_1^1 = \frac{(3-2\alpha)E_2 - 3(1+\alpha)E_1}{4} \quad (16)$$

The most market share and profit of the product1,2:

$$\begin{aligned} Q_1^1 &= \frac{(1-2\alpha)E_2 - (1+\alpha)E_1}{4[(1-\alpha)E_2 - (1+\alpha)E_1]} \\ Q_2^1 &= \frac{(3-2\alpha)E_2 - 3(1+\alpha)E_1}{4[(1-\alpha)E_2 - (1+\alpha)E_1]} \\ \pi_1^1 &= \frac{[(1-2\alpha)E_2 - (1+\alpha)E_1]^2}{4[(1-\alpha)E_2 - (1+\alpha)E_1]} - C_1 \\ \pi_2^1 &= \frac{[(3-2\alpha)E_2 - 3(1+\alpha)E_1]^2}{16[(1-\alpha)E_2 - (1+\alpha)E_1]} - C_2 \end{aligned} \quad (17)$$

Owing to  $0 < \alpha < 1, E_2 > E_1$ , there is

$$\begin{aligned} P_2^1 - P_1^1 &= \frac{[(1+2\alpha)E_2 - (1+\alpha)E_1]^2}{4} > 0 \\ Q_2^1 - Q_1^1 &= \frac{E_2 - (1+\alpha)E_1}{2[(1-\alpha)E_2 - (1+\alpha)E_1]} > 0 \end{aligned} \quad (18)$$

This shows that the higher service quality product 2 come into the product 1 market Stackbelberg game, quality service higher enterprises to obtain a higher market share, product prices higher, therefore it has a higher market profit.

The market price, share is positive, so  $(3-2\alpha)E_2 - 3(1+\alpha)E_1 > 0$

(2) Product 1 come into the product 2 market

Stackbelberg game that product 1 comes into product 2 market, adopt the method of backstepping, by using providing product 1 the first-order condition profit function to get



$$P_1^2 = \frac{P_2^2 - \alpha E_2}{2} \quad (19)$$

Put the equation into the profit function of product 2, then using the first-order conditions obtained optimal market price of product 2:

$$P_2^2 = \frac{(2 - \alpha)E_2 - 2(1 + \alpha)E_1}{2} \quad (20)$$

Put it into the formula of product 1 price

$$P_1^2 = \frac{(2 - 3\alpha)E_2 - 2(1 + \alpha)E_1}{4} \quad (21)$$

Then we get the Stackbelberg game that product 1 come into the product 2 market the optimal market share and profit of product 1 and product 2 were

$$\begin{aligned} Q_1^2 &= \frac{(2 - 3\alpha)E_2 - 2(1 + \alpha)E_1}{4[(1 - \alpha)E_2 - (1 + \alpha)E_1]} \\ Q_2^2 &= \frac{(2 - 3\alpha)E_2 - 2(1 + \alpha)E_1}{4[(1 - \alpha)E_2 - (1 + \alpha)E_1]} \\ \pi_1^2 &= \frac{[(2 - 3\alpha)E_2 - 2(1 + \alpha)E_1]^2}{16[(1 - \alpha)E_2 - (1 + \alpha)E_1]} \\ \pi_2^2 &= \frac{[(2 - \alpha)E_2 - 2(1 + \alpha)E_1]^2}{8[(1 - \alpha)E_2 - (1 + \alpha)E_1]} \end{aligned} \quad (22)$$

By the inequality and assumptions, namely

$$\begin{aligned} P_2^2 - P_1^2 &= \frac{(2 + \alpha)E_2 - 2(1 + \alpha)E_1}{4} > 0 \\ Q_2^2 - Q_1^2 &= \frac{2\alpha E_2}{4[(1 - \alpha)E_2 - (1 + \alpha)E_1]} > 0 \end{aligned} \quad (23)$$

This shows that the higher service quality product 1 come into the product 2 market Stackbelberg game, quality service higher enterprises to obtain a higher market share, product prices higher, therefore it has a higher market profit.

The market price, share is positive, there is

$$(2 - 3\alpha)E_2 - 2(1 + \alpha)E_1 > 0 \quad (24)$$

Synthesize all the inequalities, can be attributed to  $(1 - 2\alpha)E_2 - (1 + \alpha)E_1 > 0$ , and because the hypothesis  $E_1 < E_2 < 2E_1$ , so there is  $0 < \alpha < 0.2$ .

### 3.3.3 Analysis of the Equilibrium Result of the Game

Analysis the two to enter the market results

For product 1, we can get

$$\begin{aligned} P_1^2 - P_1^1 &= \frac{\alpha E_2}{4} > 0 \\ Q_1^2 - Q_1^1 &= \frac{1}{4} > 0 \end{aligned} \quad (25)$$

Product 1 who's quality of service levels are lower entered the market to obtain a higher market price and share, therefore have more market profit. The external factor  $\alpha$  is greater, the price difference is larger.

For product 1, we can get

$$\begin{aligned}
 P_2^2 - P_2^1 &= \frac{E_2 - (1 + \alpha)E_1}{4} > 0 \\
 Q_2^2 - Q_2^1 &= -\frac{1}{4} < 0 \\
 \pi_2^2 - \pi_2^1 &= \frac{[(2 - \alpha)E_2 - 2(1 + \alpha)E_1]^2}{8[(1 - \alpha)E_2 - (1 + \alpha)E_1]} - \frac{[(3 - 2\alpha)E_2 - 3(1 + \alpha)E_1]^2}{16[(1 - \alpha)E_2 - (1 + \alpha)E_1]} \quad (26) \\
 &= \frac{[(3 - 2\alpha)E_2 - 3(1 + \alpha)E_1] + \sqrt{2}[(2 - \alpha)E_2 - 2(1 + \alpha)E_1]}{16[(1 - \alpha)E_2 - (1 + \alpha)E_1]} \\
 &\bullet \left\{ \left[ (2\sqrt{2} - 3) + (2 - \sqrt{2}\alpha) \right] E_2 + (3 - 2\sqrt{2})(1 + \alpha)E_1 \right\}
 \end{aligned}$$

To make the equation  $> 0$ , namely  $\frac{(3 - 2\sqrt{2})(1 + \alpha)}{(3 - 2\sqrt{2}) - (2 - \sqrt{2}\alpha)} > \frac{E_2}{E_1} > 1$ , simplify to

$$(3 - 2\sqrt{2})\alpha > -(2 - \sqrt{2}\alpha), \text{ Obvious, it's true, there is } \pi_2^2 - \pi_2^1 > 0.$$

Therefore product 2 quality service of higher level does not suit entering the market later, the first to enter the market with higher profit in the market. The external factor is greater, the price difference is larger.

#### 4. Conclusions

The product coming into the market can be a quality service with lower levels of products, the earlier to enter the market, the higher market price and share, therefore get more market profit; Quality service with higher levels of products will have a higher market share and product price in either case, although is not as good as the first to enter the market to get high profits, but it's feasible market entry strategies. The conclusion of this paper is got from the product quality and service level is proportional and the external factor among product is same, and less than 0.2, and market is ideal; Dividing the binary structure, broaden the market and the external factor constraints are in-depth research directions.

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