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The Research of the Marketing Channel Conflict Based on the Analysis of the Game Theory

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Abstract

In order to solve the marketing channel conflict more rationally, this thesis advances a new way by making use of game theory. It connects the game theory and the conflict of marketing channels together and puts up two kinds of models based on the game theory. According to the models, the thesis analyzes channel member's behavior. And then it finds the reasons of marketing channel conflicts by game theories.

Keywords: Marketing channel, Channel conflict, Game theory model

1. Introduction

The marketing channel conflict means that a channel member considered another member preventing or disturbing his goal. With the constant development of the socialist market economy of our country, the furious market competition comes along with the marketing channel conflict, some of which has already affected enterprises' performance. More and more analysis of the marketing channel conflict have been put into handling so as to get a better understanding to manage it. When analyzing the marketing channel conflict, it's always thought to be a member of social system, the subjective factors such as emotion and knowledge are taken into consideration. But from the research angle of economics, this thesis below supposes channel members to be rational decision maker who maximize their own profits when faced with a given condition, in spite of the subjective characteristics. It constructs two kinds of game models with retailers and manufacturers so as to carry out a detailed analysis of the conflict in marketing channels.

2. The Hypothesis of Building A Model

In order to facilitate the study, several hypotheses of building a model are introduced at first:

(1) For facilitating the analysis, the marketing channel of product M (M below) is made up of producer and the only retailer, however, it's more complex than this in reality.

(2) The demand of the M is uncertain for the not fully competitive market it's faced with. Supposes the demand for the product to be a linear function of $q=a-bp$, in which b stands for the uncertainty of marketing demand, defined as continuous random variable$(0, \infty)$,and F as its distribution function, and the final price of product M is composed of two parts - wholesale w and retail increase business r, that is $p=w+r$.

(3) Manufacturers and retailers are both rational decision makers, that is, both of them maximize profits for their own decision-making. Additionally, the risk that may be faced with is neutral, which means that the decision-makers are aim to maximize mean profits (or profit expectations) with the condition of the uncertainty of marketing demands.

(4) The cost of production and distribution of M is fixed, and also generally sets as zero, whose simplification will not affect the conduct of members of the channel analysis.

According to 4 hypotheses above, the profit for the function of manufacturers and retailers can be partly showed as:

$$\Pi = w\times q = w[a-b(w+r)] \qquad (1)$$

$$\pi = r\times q = r[a-b(w+r)] \qquad (2)$$

3. The Decision-Making Model of Manufacturers and Retailers at the Same Time

There're three kinds of situations below, all of which are game models in decision-making at the same time, that is, static games, involved in manufacturers and retailers.

3.1 Decision-makers Both Know the Specific Function of the Demand - Cournot Model

In this case, manufacturers and retailers are both know the exact product demand. At this point, based on the different b, manufactures will be choose w to maximize their own profits, and the profit maximization of the first order conditions are as follows:

$$\frac{d\Pi}{dw} = a - 2bw - br = 0 \tag{3}$$

According to this, it has a response function: $w = \frac{a-br}{2b}$; similarly, retailers' maximize profit for the first-order conditions:

$$\frac{d\pi}{dr} = a - bw - 2br = 0 \tag{4}$$

Its response function: $r = \frac{a-bw}{2b}$, which means that the balance of these two conditions meet at the same time, and solve function reaction of the two available Cournot equilibriums:

$$w = r = \frac{a}{3b} \tag{5}$$

Take(5)into(l) (2)can be:

$$\Pi = \pi = \frac{a}{3b}(\frac{3ab-2ab}{3b}) = \frac{a^2}{9b} \tag{6}$$

The type (6), in which we can get the biggest profits mean of manufacturers and retailers:

$$\mathrm{E}[\Pi]' = \mathrm{E}[\pi]' = \int \frac{a^2}{9b} dF = \frac{a^2}{9}\int \frac{1}{b} dF \tag{7}$$

3.2 Neither of Decision-makers Know the Specific Needs of Function – Cournot Model Expanding

In this case, neither of them know the specific needs of the function, just know the distribution function of the demand function. The model distinguishes the model Cournot with the decision-makers' uncompleted information. Taking the uncertainty of demands into consideration, both sides make decisions on prices based on maximizing their own profits.

For manufacturers, profit expectations as follows:

$$\mathrm{E}[\Pi] = \int w\left[a - b(w+r)\right]dF \tag{8}$$

The first order condition of profit maximization is:

$$\frac{d\mathrm{E}[\Pi]}{dw} = \int\left[a - b(w+r) + w(-b)\right]dF = 0 \tag{9}$$

Its reaction function: $w = \frac{a-\bar{b}r}{2\bar{b}}$; as for retailers, the expectation for profits:

$$\mathrm{E}[\pi] = \int r\left[a - b(w+r)\right]dF \tag{10}$$

First-order conditions for profits maximization:

$$\frac{d\mathrm{E}[\pi]}{dr} = \int\left[a - b(w+r) + r(-b)\right]dF = 0 \tag{11}$$

Its reaction function: $r = \frac{a-\bar{b}w}{2\bar{b}}$; which means that the balance of these two conditions meet at the same time, solving the response of the two functions can get:

$$w = r = \frac{a}{3\bar{b}} \tag{12}$$

Take (12) into(8)(10)can get the biggest expectation for profits of manufacturers and retailers:

$$\mathrm{E}[\Pi]^2 = \mathrm{E}[\pi]^2 = \int \frac{a}{3\bar{b}}\left(a - \frac{2ab}{3\bar{b}}\right)dF = \frac{a^2}{9\bar{b}} \tag{13}$$

3.3 Only Manufacturers Know the Specific Function of the Demand - Uncompleted Information of Static Games

In this case, assuming that only manufacturers know the specific needs of products, who is aware of the specific value of b, however, retailers just know the distribution of it, both sides make a decision at the same time. At this point, according to each specific value of b, manufacturers will set a w to maximize its profits for the first-order conditions:

$$\frac{d\Pi}{dw} = a - b(w+r) + w(-b) = 0 \tag{14}$$

According to which can get its reaction function:

$$w = \frac{a - br}{2b} \tag{15}$$

As retailers know that manufacturer decide the value of w based on the specific value of b, who also set w as the function of b, so as to determine to maximize their own profits, that is:

$$\frac{d\mathrm{E}[\pi]}{dr} = \int \left[a - b\left(w(b) + r\right) + r(-b) \right] dF = 0 \tag{16}$$

Take(15)into(16), that is: $r = \frac{a}{3\bar{b}}$ (17)

Then, take(17)into(15), getting: $w = \frac{a}{2b} - \frac{a}{6\bar{b}}$ (18)

Take(17) (18)into(10), in which we can get the expectation for profits of retailers:

$$\mathrm{E}[\pi]^3 = \int \frac{a}{3\bar{b}} \left[a - b\left(\frac{a}{2b} - \frac{a}{6\bar{b}} \right) - b\frac{a}{3\bar{b}} \right] dF = \frac{a^2}{9\bar{b}} \tag{19}$$

Take(17)(18)into(1),in which we can get producers' profits:

$$\Pi(b) = \frac{a^2}{4b} + \frac{a^2 b}{36\bar{b}^2} - \frac{a^2}{6\bar{b}} \tag{20}$$

Take the expectation value of type(20), manufacturers' average profit can be achieved:

$$\mathrm{E}[\Pi]^3 = \int \Pi(b) dF = \frac{a^2}{4} \int \frac{1}{b} dF - \frac{5a^2}{36\bar{b}} \tag{21}$$

3.4 Conclusions

Different circumstances of three models above show the balance of state channels and channel members'average profit. In order to analyze the behavior of the members, we need to compare the average profits of the three cases, in which we need to come to understand the relationship between $\int \frac{1}{b} dF$ and $\frac{1}{\bar{b}}$ for the reason that $\frac{1}{b}$ is a kind of strict convex function, then we can get $\int \frac{1}{b} dF > \frac{1}{\bar{b}}$ based on an inequality of Jense, so $\int \frac{1}{b} dF - \frac{1}{\bar{b}} > 0$.

Compared with three cases above about decision-makers' average profits and mean average profits, we can draw the following conclusions:

(1) The average profits of channels and average profits of channel members in the situations that both two sides do not know the specific needs of product information are the smallest value.

(2) If only one side knows the specific circumstances, who will maximize its channel average profits and the channel members average profits, but another one just the opposite.

4. Manufacturers -Led Models

The following three cases, the assumption is made that manufacturers are in the dominant on pricing when producers make a price at first, after which retailers make their decision-making prices. For the order of the game, so the three conditions are called dynamic games.

4.1 Both of the Decision-makers Know the Function of the Specific Needs of Model-Stackelberg

It is a kind of typical completed information of dynamic games, the strategy is the choice of price rather than production. With the Stackelberg of the solution into reverse, the first order conditions of the retailer's profit maximization is:

$$\frac{d\pi}{dr} = a - b(w + r) + r(-b) = 0 \tag{22}$$

Its reaction function: $r = \frac{a - bw}{2b}$ (23)

r should be noted that it is the retailers'actual selection after the w of manufacturer of choice. Retailers also know that the producers will make a pricing decision in accordance with the above-mentioned reaction functions, then the manufacturers' issue will be the Max Π (r), the first order conditions are as follows:

$$\frac{d\Pi}{dw} = a - 2bw - b\frac{a - bw}{2b} = 0 \tag{24}$$

In which we can get: $$w=\frac{a}{2b} \tag{25}$$

In accordance with the reaction functions, retailers' increasing price will be as follows:

$$r=\frac{a-bw}{2b}=\frac{a}{4b} \tag{26}$$

Take(25) (26)into(1)(2):

$$\Pi(b)=\frac{a}{2b}\left[a-b\left(\frac{a}{2b}+\frac{a}{4b}\right)\right]=\frac{a^2}{8b} \tag{27}$$

$$\pi(b)=\frac{a}{4b}\left[a-b\left(\frac{a}{2b}+\frac{a}{4b}\right)\right]=\frac{a^2}{16b} \tag{28}$$

Take the expectation value of type(27)(28), both sides' maximizing profits can be achieved:

$$\mathrm{E}[\Pi]^4=\int\frac{a^2}{8b}dF=\frac{a^2}{8}\int\frac{1}{b}dF \tag{29}$$

$$\mathrm{E}[\pi]^4=\int\frac{a^2}{16b}dF=\frac{a^2}{16}\int\frac{1}{b}dF \tag{30}$$

4.2 Neither of the Decision-makers Know the Function of the Specific Needs of Model-Stackelberg Expanding

In this case, both two sides will make a decision in accordance with the distribution of b, in which the strategy game collection is no longer a certainty. Additionally, the decision-makers' goal is to maximize profit expectations. We are still considering retailers' decision-making as a starting point. At this point, the first-order conditions of retailers' maximizing profits are:

$$\frac{d\mathrm{E}[\pi]}{dr}=\int\left[a-b(w+r)+r(-b)\right]dF=0 \tag{31}$$

Its reaction function: $$r=\frac{a-\bar{b}w}{2\bar{b}} \tag{32}$$

Retailers come to know that producers will react for the price in accordance with the reaction functions mentioned above, then the manufacturers' issue will be MaxE[Π](r), the first order conditions are as follows:

$$\frac{d\mathrm{E}[\Pi]}{dw}=\int w\left[a-\left(w+\frac{a-\bar{b}w}{2\bar{b}}\right)\right]dF=0 \tag{33}$$

In which we can get: $$w=\frac{a}{2\bar{b}} \tag{34}$$

In accordance with the reaction functions, retailers' increasing price will be as follows:

$$r=\frac{a-\bar{b}w}{2\bar{b}}=\frac{a}{4\bar{b}} \tag{35}$$

Take(34)(35)into(8)(9) both producers'and retailers'maximizing profits can be achieved:

$$\mathrm{E}[\Pi]^5=\int\frac{a}{2\bar{b}}\left[a-b\left(\frac{a}{2\bar{b}}+\frac{a}{4\bar{b}}\right)\right]dF=\frac{a^2}{8\bar{b}} \tag{36}$$

$$\mathrm{E}[\pi]^5=\int\frac{a}{4\bar{b}}\left[a-b\left(\frac{a}{2\bar{b}}+\frac{a}{4\bar{b}}\right)\right]dF=\frac{a^2}{16\bar{b}} \tag{37}$$

4.3 Only Manufacturers Know the Specific Function of the Demand - Uncompleted Information of Dynamic Games

In this case, retailers' information is uncompleted. If retailers still make pricing decisions on maximizing expecting profits, whose first-order conditions of maximizing profits will be:

$$\frac{d\mathrm{E}[\pi]}{dr}=\int\left[a-b(w+r)+r(-b)\right]dF=0 \tag{38}$$

Its reaction function: $$r=\frac{a-\bar{b}w}{2\bar{b}} \tag{39}$$

Retailers know that the producers will make decisions on price in accordance with the reaction functions mentioned above, then the manufacturers' issue will be Max Π (r), the first order conditions are as follows:

$$\frac{d\Pi}{dw}=a-b\left(\frac{a}{2\overline{\overline{b}}}-\frac{w}{2}+w\right)-\frac{1}{2}bw=0 \tag{40}$$

In which we can get: $$w=\frac{a}{b}-\frac{a}{2\overline{\overline{b}}} \tag{41}$$

In accordance with the reaction functions, retailers'increasing price will be as follows:

$$r=\frac{a-\overline{b}w}{2\overline{b}}=\frac{3a}{4\overline{\overline{b}}}-\frac{a}{2b} \tag{42}$$

Take(41)(42)into(1):

$$\Pi(b)=\left(\frac{a}{b}-\frac{a}{2\overline{\overline{b}}}\right)\left[a-b\left(\frac{a}{b}-\frac{a}{2\overline{\overline{b}}}+\frac{3a}{4\overline{\overline{b}}}-\frac{a}{2b}\right)\right]=\frac{a^2}{2b}-\frac{a^2}{2\overline{\overline{b}}}+\frac{a^2b}{8\overline{\overline{b}}} \tag{43}$$

Their expected profits from manufacturers are:

$$\mathrm{E}[\Pi]^6=\int\left(\frac{a^2}{2b}-\frac{a^2}{2\overline{\overline{b}}}+\frac{a^2b}{8\overline{\overline{b}}}\right)dF=\frac{a^2}{2}\int\frac{1}{b}dF-\frac{3a^2}{8\overline{\overline{b}}} \tag{44}$$

Take(41)(42)into(10),retailers'expected profits:

$$\mathrm{E}[\pi]^6=\int\left(\frac{3a}{4\overline{\overline{b}}}-\frac{a}{2b}\right)\left[a-b\left(\frac{a}{b}-\frac{a}{2\overline{\overline{b}}}+\frac{3a}{4\overline{\overline{b}}}-\frac{a}{2b}\right)\right]dF=\frac{5a^2}{16\overline{\overline{b}}}-\frac{a^2}{4}\int\frac{1}{b}dF \tag{45}$$

4.4 Conclusions

Compared with three cases above about decision-makers'average profits and mean average profits, we can draw the following conclusions:

(1) The average profits of channels and average profits of channel members in the situations that both two sides know the information can get more value.

(2) If only one side knows the specific circumstances, the total profits of channels are the largest value.

(3) It can get larger profits from the exclusive information than the sharing information for some particular channel members.

5. Summary

Simultaneously mutual-decision-making model and manufacturer-led model distinguish as follows:

(1) Under any circumstances, the total profits (E[Π]+E[π]) are worth more value in simultaneously mutual-decision-making model than one side-led model.

(2)Two types of models show that average profits may increase on the condition that both sides know the information of products. The one side-led model, however, the first actor (such as the manufacturers) will obtain more incremental profits than simultaneously mutual-decision-making model works, while another side gets smaller.

(3)As with the simultaneously mutual-decision-making model, the one side-led model, whose exclusive information is more of the profits for members of the specific channels (such as the manufacturers), thus the exclusive information brings up more driving force.

With the marketing channels conflicts analyzed though the game model, we can see the causes of the conflicts lies in the channel members who would like to achieve the maximization of self-interest in different concerns. If some members of the channel are given priority to enjoy the first operation dueling to various of reasons, their driving force of departure from the cooperation will be more obvious, which leads into the channel conflicts with a decline in the overall operational efficiency and profits, conflicts become inevitable.

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