

# The Study of Interest Sharing Mechanism of Marketing Channels Based on Cooperative Game Theory

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**Abstract** The specialization and synergic effect of marketing channel members gets the source of channel benefits. However, the rule of interest coordination or alleged criteria of profits sharing is the significant basis for the stability of the members' synergic operation, which currently becomes one of the hot academic issues in marketing management. By Using the game theory and relevant method, this paper analyzes the interactions of each member and their relationships on interests sharing, and considers that the game among the alliance members keeps the cooperative game theory. According to this basis, this paper establishes a coordination mechanism of marketing channels based on cooperative game with the shapley value distributive system.

**Key words** Marketing channels; Interests sharing; Cooperative game theory; Mechanism

## 1 Introduction

Generally, a marketing channel could be viewed as a set of interdependent organizations which promotes the consumption of products and services. Along with the specialization of social division and development of the market exchange, the functional interdependence for each channel member is constantly increasing, which leads to the necessity of channel members' cooperation. However, the maximized individual interest is one of the main purposes and positive results that each alliance member is always seeking for. Therefore, during the process of cooperation, once facing certain opportunities for increasing interests of its own, yet might decreasing the benefits of its partners, each member, as a "rational economist", would engender divaricating and conflict with other members. This might further deliver some unexpected negative results, such as increased transactional costs, damaged benefits for each alliance members and uncertainty for the channel's stability. Thus, with regard to the optimization of overall long-term benefits, the coordination of channel members' interests and maintenance of channels' stability is always be considered a focused issue for marketing management.

Many a research has been already carried out on the interest's conflict and its coordination of marketing channels. Kotle (2000) pointed out that a standard traditional marketing channel is constituted by an independent producer, wholesalers and retailers. Each single member, as an independent enterprise entity in this channel, is bound to be in the pursuit of the maximized profit of its own, even if it might be on the damage of systematic expense. Yet in fact, there is no individual member who has complete or even adequate capability of control for other members. In a fragmented sales network, manufacturers, wholesalers and retailers, who bargain and negotiate the price and terms of sales while act in their own way, array discretely. Almost all the members here are opportunists. This might makes the conflicts among each channel members, which further lead to the increased transactional costs, damaged benefits for each alliance members, etc<sup>[1]</sup>. The relevant research of Audenson (1993) shows that through repetitive interactions and adequate key events, the transactional relationship of channel members would become and turn to a real and genuine partnership. The study of Nirmalgakwmar (2004), indicates that the manufacturers who get good relationship with their dealers could gain more competitive advantage. Fang Ji (2008) suggested that enterprises take effective mechanisms for communication and benefit sharing positively in order to reduce the conflicts in channels<sup>[2]</sup>.

Here are some relevant researches regarding the issue of interests sharing: Shapley (1953) delivered the method of allocation of interests in an N roles model<sup>[3]</sup>. Based on the assumption of "rational economists", Jianmei Yang (1999) established the soft systematic methodology on coordination of interests and analyzed its process with cooperative game theory. Using the "commissions and agents" theory, Wenjun Zheng (2001) carried out a deep research on the same issue and provided the basic principle and model for the profits sharing mechanism of virtual enterprises. Huhong Chen (2002) analyzed the factors which should be taken into the consideration in the process of profits sharing, and put forward the model of game theory concerning this area. Guibin Yang (2004) provided another relevant model not only for the members' interests sharing but also their risk taking. Shaohua Lu and Zhixiang Tao (2004) demonstrated the disadvantages on bargaining and non-cooperative game theory and pointed out that cooperative game option would be the optimum strategy in sales game. Huipin Pan

and Rongqiu Chen (2005) who studied in the method of quantization different profit ranges and interests rates, analyzed the impact on profits of each member based on diverse sharing rates. The related academic researches mentioned above offer helpful and constructive guidance and reference for this paper.

## 2 The Analysis in the Cooperative Game of Marketing Channel Members

As a matter of fact, the transaction among the members is an issue of game theory. According to the theory, the income or profit of each member depends not only on its own behavior but also the behaviors of other members. Basically, the game includes two types: cooperative one and non-cooperative one. As for the former, both sides on a game are supposed to restrict their own egoism. They should focus on not only their own maximized profits but also the common and mutual interests as a whole, which leads to forming a restraining cooperative protocol for both sides. As for the latter one, the two sides overstate their own interests as an individual; thereby back down their cooperative agreement and compromise. Nevertheless, when each side makes their choice on cooperative or non-cooperative option, it does not know exactly what kind of strategy its opposite side would choose, yet both sides would forecast the choice of its rival and finally make their own.

Suppose that there are only two members in a certain channel: a manufacturer and a distributor. Both sides could choose their own strategy independently. Their game matrix is illustrated as following, where  $D > A > B > C$ .

**Table 1 The Game Income Matrix of a Manufacturer and a Distributor**

	Distributor	cooperative	non-cooperative
Manufacturer	cooperative	(A, A)	(C, D)
	non-cooperative	(D, C)	(B, B)

According to the matrix above (Table 1.), if the manufacturer and the distributor both choose the cooperative strategy, then both sides could only get the income of A units; But if one side chooses non-cooperative strategy while the other chooses cooperative strategy, it would gain the income of D units; If both sides choose the non-cooperative strategy, then they both get the income of B units; But if one side chooses cooperative strategy yet the opposite side chooses the non-cooperative one, it would gain the lowest income level, C units. Thus, no matter how manufacturer chooses its strategy, as for the distributor, the income on non-cooperative strategy keeps more than that on cooperative strategy. Similarly, no matter how distributor chooses its strategy, as for the manufacturer, its income on non-cooperative strategy keeps more than that on cooperative strategy. In fact, this process is a striking example of the famous Nash equilibrium strategy, which means that both sides would choose the non-cooperative strategy, and then they both get the income of B units. Obviously, this equilibrium is not on the Pareto optimal strategies, which means that both sides would choose the cooperative strategy, and then both sides could only get the income of a units. One significant cause leading the result is based on the assumption of one-off transaction. With out adequate information exchange and efficient learning effect, each side of the game would only choose the non-cooperative strategy in order to make sure their own interests maximized.

However, these transactions are not one-off disposable but long-term sustainable. Only one non-cooperative or betrayal action might occur the mistrust of its partners or even lead to their revenge in following transactions. In this case, the benefit considerations of channel members turn different from that on one-off transaction. Mention to the multiple and repeated transactions, channel members are no longer supposed to be considered as completely independent individuals but should be viewed as elements in an organizational behavior subject of a whole marketing channel. When a behavior subject appears as an organization form, the game strategies of its secondary subjects would turn non-cooperative into cooperative. In a game, both sides would obey their extant agreement, which is definitely following the premise that the income of both sides to comply with the treaty would get much more than not to. This requires that cooperative game should have the function of value creating, which makes the channel members benefit from the whole interests increase. This interest's increase would be indicated in several aspects:

First, decrease the costs of channels. Once a producer forms a cooperative relationship with a distributor, their negotiating cost would be significantly reduced. The distributor could more easily gain

a stable access for competitive prices and reliable quality products from the producer, meanwhile the producer could get more area information through the distributor and better satisfy the diverse needs of its target customers. Moreover, the producer could also reduce its expense on inventory, promotion and finance to some extent.

Second, realization of information sharing. Once a producer forms the cooperative relationship with a distributor, they establish a mechanism of information sharing. The distributor would provide a set of key information which might contain the sales data, customers' expectation for products and Tendency of the market variation. Meanwhile the producer could offer another set of useful information which might include precise volume of certain stock, promotion process of latest products, sales states of various products and new marketing plans. This aspect would no doubt improve the degree of rational operating decision of both sides.

Third but not least, enhancing the brand image (BI) and virtual identity (VI). The BI and VI of an enterprise depend on not only itself but also the sales process of its distributors and dealers. Once formed the cooperative relationship, a producer and its distributors could provide constant customer service of high quality through erecting an integrated products image, and finally get customer loyalty more.

In sum, although each channel member gets the motivation of opportunism, in long-term sustained and multiple transactions' process, the alleged rational action of an individual enterprise usually lead to an uneconomical result, which deviates from its original intention for seeking the maximized interests of its own. Therefore, both sides involving a game would be inclined to hold cooperative attitudes in order to achieve the Pareto optimal equilibrium. Thus, in a long-term game, each result a time is caused by the strategic decisions which are usually after the consideration for future transactional effectiveness and efficiency.

### **3 The Mechanism of Marketing Channels Interests Sharing Based on Cooperative Game**

Being independent subjects for interests, channel members form an alliance in order to obtain more profits, while having competition and conflicts with each other in the pursuit of individual interests. Therefore, How to coordinate the sharing of incomes and how to make every member could gain more from the whole above average profits are critical issues for the maintenance of a stable alliance.

#### **3.1 The analysis on main factors of marketing channels interests sharing**

There are many negative dominant factors for this issue. Here are the typical three:

First, interest targets. Marketing channels are essentially dynamic unions combined by channel members who have their own egoism and opportunism on maximized profits, which makes the inadequate cooperation of members. As for a manufacturer, it undertakes a series of costs including R&D, manufacturing and channel development. As for a distributor, it only takes the risk and cost of sales. Thus, the former is more likely to be in the pursuit of long-term interests while the latter is inclined to chase the short-term one. And this difference in interest targets leads the organizational disharmony.

Second, The fields on rights and responsibilities. Each channels member would demarcate its own domain of rights and responsibilities. Each member would release a passive and negative attitude for cooperation, when the member finds that its partner does not set an enough attention on its area. For instance, a manufacturer might reduce its shipments for a dealer, if it finds the distribution rate of the dealer is under the level of stipulation. While as a revenge, the dealer would probably completely quit the sale for the manufacturer's products. Since the manufacturer loses some of its customers and the dealer misses one profit point, this might be a "lose-lose" solution.

Third, avoiding risk. For seeking the maximized profit, each member is inclined to shift its risk to other members in the alliance. For example, manufacturer usually raises the price of a new product in order to share the risk of its R&D cost, which yet directly shifts the risk to its distributor. However, the distributor would probably correspondingly raises the price to the consumption of customers, which eventually damages the value of customers.

#### **3.2 The mode construction of channels interests sharing**

As mentioned above, in a game, both sides would obey their extant agreement, which is definitely following the premise that the income of both sides to comply with the treaty would get much more than not to. Although, in certain conditions, the cooperation is attested to bring more overall profits of the whole channel, the profits increase only presents the possibility for the increase of individual but does

not equal to the increase itself. The interest's increment of each member not only depends on the whole organizational increment, but also refers to the specific mechanism of interests sharing. Therefore, a fair and reasonable mechanism for profits sharing is the key basis and critical core of the efficient cooperation.

The interests' sharing of channels has many methods. Here is one of such named mode of Shapley value<sup>[4]</sup>.

For an alliance of  $n$  members  $N = \{1, 2, 3, \dots, n\}$ , If any of its subset  $S$ , there would be a real value function  $V(S)$  which satisfies  $V(\Phi) = 0$  and  $V(S_1 \cup S_2) \geq V(S_1) + V(S_2), S_1 \cap S_2 = \Phi$ , then  $[N, V]$  could be named as an  $n$  number cooperative decision. Here  $V$  is the eigenfunction,  $V(S)$  is the income of subset  $S$  in alliance.

If  $X_i (i = 1, 2, 3, \dots, n)$  is the deserved income for the member  $i$  in set  $N$ , which is out of the maximized income  $V(N)$  of the alliance, then  $X_i = (X_1, X_2, \dots, X_n)$  could be named as the interest sharing of this cooperative decision. Here are some qualifications for it:

(1)  $V(S) > \sum_{i \in S} V(i)$  indicates that there are surplus incomes in the alliance, compared with the counterpart which is the result of the independent decision by each individual.

(2)  $X_i \geq V(i), \forall i \in N$  presents that the income for the member  $i$ , which is out of the maximized income  $V(N)$  of the alliance, is no less than the income  $i$  choose non-cooperative strategy.

(3)  $\sum_{i \in S} X_i \geq V(S), \forall S \subset N$  means that the income of each member in the subset  $S$  in the maximized profit  $V(N)$  is no less than that could be gain only in the subset  $S$ .

In addition, the Shapely value method mentioned above is based on the following axioms:

(1) The income  $X_i$  for each member has nothing to do with the order of certain member.

(2) The sum of incomes of all participants equals to income of alliance, which can be presented as  $\sum_{i \in N} X_i = V(N)$ .

(3) If certain member participates two alliances of  $n$  members,  $[N, V]$  and  $[N, W]$ , then there is  $X_i(V + W) = X_i(V) + X_i(W)$ , which could be presented that the income of this member equals to the sum of two incomes from each alliance.

(4) If for any of the  $i$  out of set  $S$ , there is  $V(S - i) = V(S)$ , where  $S - i$  means set  $S$  without  $i$ , and then there is  $X_i(V) = 0$ . If member  $i$  has no contribution in the profit increment of the whole alliance, it is not supposed to gain any income.

If the array  $[N, V]$  satisfies the above set of axioms, then there is only one Shapely value for this alliance which could be demonstrated as follow:

$$X_i = \sum_{S \subset N} \frac{(|S|-1)!(n-|S|)!}{n!} [V(S) - V(S-i)] \tag{1}$$

Here  $|S|$  means the number of the members in the alliance  $|S|$ .

With its attribute of fairness and reasonableness, Shapley value could be considered and set as the criteria for the interest sharing of each member, which might probably make the cooperative game stable and efficient.

#### 4 Conclusion

Each member in a marketing channel alliance is an independent subject who has the motivation to pursue its maximized interests. They get partners when creating profits, while turn competitors when sharing interests. Thus, a fair and reasonable mechanism for profits sharing is the key basis and critical core of the efficient cooperation. This paper establishes a coordination mechanism of marketing channels based on cooperative game with the Shapley value distributive system, in order to provide a useful reference for research on the interests sharing of marketing channels. The issue concerning the identity of interests, quantitative analysis and other dominants factors still needs further study.

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