Advances in Intelligent Systems Research, volume 153

International Conference on Applied Mathematics, Modeling and Simulation (AMMS 2017)

Research on the Online Channel Strategy of Traditional Manufacturers Based on Brand Equity

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***Abstract*—Traditional manufacturers are facing the problem of developing online sales market with the rapid development of e-commerce. In the process of online transfer, traditional manufacturers can choose to build their own platform or join the third-party cooperative platform, or adopt the combination of the two strategies, and lay particular emphasis on a certain strategy. Based on the manufacturer's brand equity, considering the cost of the manufacturer's self-built platform, the online channel strategy suitable for manufacturers is found out. It is concluded that in the case of not considering brand equity, it is appropriate for the traditional manufacturer to join the third-party cooperative platform. When manufacturers consider brand equity, it is not wise for manufacturers to only join third parties, and it is more appropriate to build online sales platforms.**

Keywords-traditional manufacturers; brand equity; online channel strategy

I. INTRODUCTION

With the development of e-commerce and network technology, the traditional manufacturing enterprises not only through traditional sales channels(such as wholesalers, retailers, etc.) to distribute products, but also sell products through online channels. In the process of traditional manufacturers selecting online channels, a part of them join Taobao, JingDong and other third-party open platforms for sales; part of the use of self built platform and joined the third party open platform combined strategy, for example, some liquor enterprises, Moutai, Wuliangye,etc. not only in the self-built platform mall sales, but also sell on JingDong; another part focus on building self built platform. Many enterprises with long-term development vision, not only join the third-party platform, but also do self built platform. For example, BYD automobile enterprise has self-built platform (BYD e purchase) in Taobao, Tmall also has its store. Zhai dongsheng, a general manager of its sales company, said that the company is currently based on its own platform, and third-party platforms are complementary. The actual situations of several different industries show that different manufacturers adopt different online channel strategies according to their own conditions. So which channel strategy is more suitable for traditional manufacturers? The analysis of this article is based on the brand assets of traditional manufacturers.

Peter Farquhar, who first defined brand equity from a customer perspective, defined the brand equity as: brand equity is the added value of the brand, and the brand equity is

*This research work is partially supported by the National Natural Science Foundation of China (No.71372120).

the attitude of consumers to use the brand[1]. In 1993, Keller proposed the concept of brand equity based on customers, which defined brand equity as: consumers' differentiation effect on the brand's marketing activities caused by brand knowledge formed in the consumer's mind[2]. The concept had three meanings, these were, brand knowledge, differentiation effect and consumer's response to brand marketing. From the perspective of product strategy, brand equity was a long-term investment to build a lasting and differentiated advantage over competitors, Pitta and Katsanis supported brand equity with the ability of brand extension[3]. Yoo has established a conceptual model that provided a good way to study the relationship between brand equity and marketing activities: marketing efforts affect brand equity by influencing the dimensions of brand equity. Meanwhile, through the direct measurement of changes in brand equity, to further verify the relationship between brand assets and marketing activities[4].

There are a great deal of theoretical and empirical researches on the online channel strategy of traditional manufacturers in the e-commerce environment. For example, Zhao and others considered the supply chain pricing decision model chosen by manufacturers' marketing channel under the condition of the retailer having dual channels. In the case of centralized decision-making and decentralized decision-making in manufacturers, this paper studied the pricing strategy that manufacturers considered not opening up or opening up network direct sales channels while carrying out profit sharing[5]. Zhao studied the channel structure of a manufacturer used dual channels to sell products, which the manufacturer sold products through traditional retailers and online direct selling channels. From the perspective of consumer utility, this paper studied three different price coordination strategies for manufacturers to open network channels to reduce the conflict of traditional retailers[6]. Li constructed a dual-channel supply chain model composed of a manufacturer and a retailer, and proposed a decision model under three different conditions. The model studied the channel pricing game of dual-channel supply chain members and the channel coordination under the maximization of the overall benefit[7]. Li studied the different channel structure of supply chain, analyzed the profit of the manufacturer under the Stackelberg game, and obtained the priority ranking of the selection of the various channel structures by the manufacturer

and the retailer[8]. Chen explored multichannel selection strategy, channel competition strategy (service competition strategy and product differentiation strategy) and multichannel cooperation strategy for electronic supply chain system under Internet environment[9]. Foreign scholars Wei Huanga and Jayashankar M assumed a stylized demand model, in which the demand depended on price, cross-channel substitution and overall market potential. First of all, in this paper, the pricing strategies were considered under monopoly environment. Then this paper considered the different channels of the competition, the alternative product competition, and the two competition existed at the same time,drew a Nash equilibrium, and studied the effect of the degree of alternative for pricing strategy [10].

This article on the basis of the above study, considering the traditional manufacturers taking online multichannel sales mode, and based on the brand assets of the manufacturer, considering the cost of a self-built platform to build economic model. By analyzing the results of the model, the online channel strategy suitable for traditional manufacturers is obtained that based on the manufacturer's brand equity. This study provides theoretical basis for traditional manufacturers to develop online channel sales model.

II. Problem Description and Model Specification

Considering the manufacturer's choice of online channel strategy, the manufacturer will have different market inputs for different channel platforms, and will tend to a certain channel platform. In this paper, an asymmetric market delivery mode is adopted, and the basic model is established as follows: suppose that the total amount of the market is 1, the market volume of the self-built platform is ε ($0\leq \varepsilon \leq 1$), the market volume of third-party open platform is $1-\varepsilon$, the sales price of self-built platform and third-party platform is P, λ is the rate of profit shared by the manufacturer to the third party platform($0<\lambda<1$), c is the base unit cost of the self-built platform($c>0$). The requirement functions of self-built platform and third-party platform are as follows:

$$\begin{cases} q_1 = \varepsilon - P \\ q_2 = 1-\varepsilon - P \end{cases} \quad (1)$$

The total market demand (Q) is as follows:

$$Q = q_1 + q_2 = 1 - 2P \quad (2)$$

The profit of the manufacturers network channels on the self built platform (π_1) and third-party platform (π_2) are as follows:

$$\begin{cases} \pi_1 = (P-c)(\varepsilon - P) \\ \pi_2 = P(1-\lambda)(1-\varepsilon - P) \end{cases} \quad (3)$$

The manufacturer pursues profit maximization, and the total profit (π) is as follows:

$$\pi = (P-c)(\varepsilon - P) + P(1-\lambda)(1-\varepsilon - P) \quad (4)$$

The first derivative of the P is calculated for the total profit (π):

$$\frac{\partial \pi}{\partial P} = \varepsilon + c + (1-\lambda)(1-\varepsilon) - 2P(2-\lambda) \quad (5)$$

Let the first derivative is 0, the result is as follows:

$$P = \frac{[\varepsilon + c + (1-\lambda)(1-\varepsilon)]}{2(2-\lambda)} \quad (6)$$

Substituting formula (6) into formula (1), the results are as follows:

$$q_1 = \frac{[\varepsilon - c + (1-\lambda)(3\varepsilon - 1)]}{2(2-\lambda)} \quad (7)$$

$$q_2 = \frac{(1-\varepsilon)(3-\lambda) - (c+\varepsilon)}{2(2-\lambda)} \quad (8)$$

The total market demand (Q) is:

$$Q = \frac{1-c-\varepsilon\lambda}{2-\lambda} \quad (9)$$

The profits of each platform and total profit (π) are as follows:

$$\pi_1 = \frac{[c+\varepsilon+(1-\lambda)(1-\varepsilon)][(\varepsilon+c)(3-2\lambda)-(1-\lambda)(1-\varepsilon)]}{4(2-\lambda)^2} - c\varepsilon \quad (10)$$

$$\pi_2 = \frac{(1-\lambda)[c+\varepsilon+(1-\lambda)(1-\varepsilon)][(1-\varepsilon)(3-\lambda)-(c+\varepsilon)]}{4(2-\lambda)^2} \quad (11)$$

$$\pi = \pi_1 + \pi_2 = \frac{[c+\varepsilon+(1-\lambda)(1-\varepsilon)]^2}{4(2-\lambda)} - c\varepsilon \quad (12)$$

The following proposition can be obtained by formulas (6), (7), (8) and (9).

Proposition 1 The price P is related to the unit cost c, and when unit cost c raises, it will push prices up. The total market demand is directly related to the price, and when the price rises, the total demand will decline. When the cost (c) rises, sales of self-built platforms and total demand will decrease, and sales on third-party platforms will rise. When the condition($\varepsilon<(2-\lambda)/(3-2\lambda)$) is satisfied, the sales volume of the self built platform is lower than that of the third party platform.

The following proposition can be obtained by formulas (10) and (11).

Proposition 2 When the following conditions are satisfied:

$$c \in \Big(\frac{\lambda(1-\lambda)+\varepsilon(3\lambda^2-6\lambda+4)-2(2-\lambda)\sqrt{(1-\lambda)[(1-\varepsilon^2)-\lambda(3\varepsilon^2-3\varepsilon+1)]}}{4-3\lambda}, \frac{\lambda(1-\lambda)+\varepsilon(3\lambda^2-6\lambda+4)+2(2-\lambda)\sqrt{(1-\lambda)[(1-\varepsilon^2)-\lambda(3\varepsilon^2-3\varepsilon+1)]}}{4-3\lambda} \Big)$$

$$\Delta = 4(2-\lambda)^2[(1-\lambda)[(1-\varepsilon^2)-\lambda(3\varepsilon^2-3\varepsilon+1)]] > 0,\ c > 0$$

The profit of the manufacturer on the self built platform is lower than the profit on the third party platform.

The following proposition can be obtained by formulas (12):

Proposition 3 When the cost satisfies the condition: $c<\lambda+4\varepsilon-3\lambda\varepsilon-1$, the total profit increases with the increase of cost. When the cost satisfies the condition: $c>\lambda+4\varepsilon-3\lambda\varepsilon-1$, the total profit decreases with the increase of the cost.

According to the above propositions, conclusions can be drawn: when the cost of self-built platform increases, the price will rise and the total sales volume will decrease. Total profits first increases with the increase of cost, when the cost increases to a certain value, the total profit will decreases. so manufacturers at the beginning of the self-built platform should increase investment, when the cost input to a certain extent, should reduce the investment. When the cost is within a certain range, the profit of the manufacturer in the self-built platform is lower than the profit on the third party platform. The manufacturer should appropriately increase or reduce the cost input of the self built platform according to the channel strategy.

Numerical analysis: for a more intuitive representation, the sales and profit curves are plotted with Matlab2010. The influence of main parameters (ε, c, λ) on manufacturer's online channel sales and profit is analyzed under the online channel strategy. For the simple analysis, this paper only considers the changes of parameters (ε, c), and randomly sets λ=0.2, the range of values $c\in(0,2)$, $\varepsilon\in(0,1)$. Make the figures as follows:

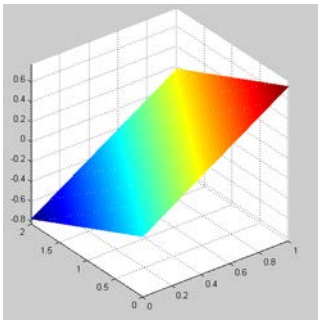

FIGURE I. SALE CHANGE OF SELF-BUILT PLATFORM

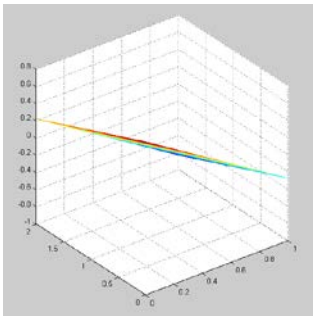

FIGURE II. SALE CHANGE OF THIRD-PARTY PLATFORM

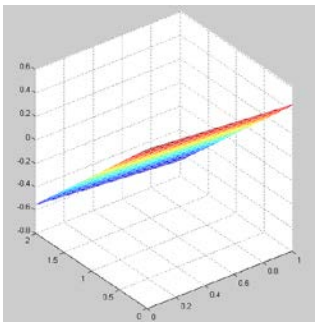

FIGURE III. TOTAL DEMAND CHANGE

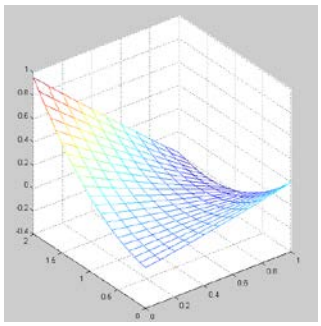

FIGURE IV. PROFIT CHANGE OF SELF BUILT PLATFORM

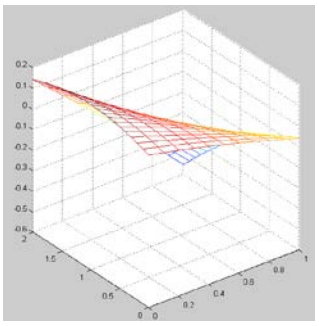

FIGURE V. PROFIT CHANGE OF THIRD-PARTY PLATFORM

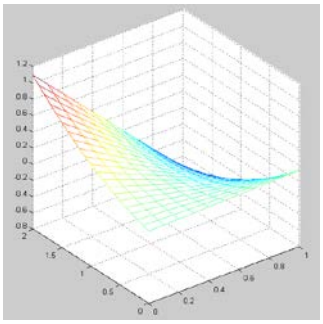

FIGURE VI. TOTAL PROFIT CHANGE

When ε=0, the market input volume of the manufacturer on the self built platform is 0, and the market input volume of the third party platform is 1. The requirement functions of total market demand and third-party platform is as follows:

$$Q = q_2 = 1 - P \tag{13}$$

The profit of the manufacturer on the third-party platform, namely the total profit:

$$\pi = \pi_2 = P(1-\lambda)(1-P) \tag{14}$$

The first derivative of the P is calculated for the total profit (π):

$$\frac{\partial \pi}{\partial P} = (1-\lambda)(1-2P) \tag{15}$$

Let the first derivative is 0, the results are as follows:

$$P = \frac{1}{2}, \quad Q = q_2 = \frac{1}{2}, \quad \pi = \pi_2 = \frac{(1-\lambda)}{4} \tag{16}$$

When ε=1, the market input volume of the manufacturer on the self built platform is 1, and the market input volume of the third party platform is 0. The requirement functions of total market demand and self built platform is as follows:

$$Q = q_1 = 1 - P \tag{17}$$

The profit of the manufacturer on the self built platform, namely the total profit:

$$\pi = \pi_1 = (P-c)(1-P) \tag{18}$$

The first derivative of the P is calculated for the total profit (π):

$$\frac{\partial \pi}{\partial P} = 1 + c - 2P \tag{19}$$

Let the first derivative is 0, the results are as follows:

$$P = \frac{1+c}{2}, \quad Q = q_1 = \frac{1-c}{2}, \quad \pi = \pi_1 = \frac{(1-c)^2}{4} \tag{20}$$

To facilitate analysis and comparison, the following table is made:

TABLE I. COMPARISON OF PRICE, SALES VOLUME AND PROFIT UNDER DIFFERENT CHANNEL STRATEGIES

Model result	Channel strategies		
	①Self-built and third-party platform	②Self-built platform	③ Third-party platform
P	$\frac{[\varepsilon + c + (1-\lambda)(1-\varepsilon)]}{2(2-\lambda)}$	$\frac{1+c}{2}$	$\frac{1}{2}$
Q	$\frac{1-c-\varepsilon\lambda}{2-\lambda}$	$\frac{1-c}{2}$	$\frac{1}{2}$
π	$\frac{[c+\varepsilon+(1-\lambda)(1-\varepsilon)]^2}{4(2-\lambda)} - c\varepsilon$	$\frac{(1-c)^2}{4}$	$\frac{(1-\lambda)}{4}$

The following propositions can be obtained from TABLE Ⅰ:

Proposition 4 When the manufacturer adopts different channel strategy, the condition is as follows: $c<\lambda(1-2\varepsilon)/2$, the total sales of each channel strategy has the following relationship: ②<③<①.When the condition is as follows: $c\in(\lambda(1-2\varepsilon)/2, 1-2\varepsilon)$, the total sales of each channel strategy has the following relationship: ②<①<③. When the condition is as follows: $c>1-2\varepsilon$, the total sales of each channel strategy has the following relationship: ①<②<③.

Proposition 5 When the manufacturer adopts different channel strategy, the following conditions are satisfied:

$$\Delta = 4[8\varepsilon^2(2-\lambda)(1-\lambda) + (2-\lambda)(1-\lambda) + 2\varepsilon(-3\lambda^2+6\lambda-4)] > 0$$
$$c \in \Big(\lambda + 4\varepsilon - 1 - 3\lambda\varepsilon - \sqrt{(8\varepsilon^2+1)(1-\lambda)(2-\lambda) + 2\varepsilon(6\lambda-3\lambda^2-4)},$$
$$\lambda + 4\varepsilon - 1 - 3\lambda\varepsilon + \sqrt{(8\varepsilon^2+1)(1-\lambda)(2-\lambda) + 2\varepsilon(6\lambda-3\lambda^2-4)}\Big), \quad c > 0$$

The profit of channel strategy when investing in self-built platform and the third-party platform is less than the profit of channel strategy when only third party platform is invested, namely ①<③. When the following condition is satisfied:

$$c \in (1-\sqrt{1-\lambda},\ 1+\sqrt{1-\lambda})$$

The profit of self-built platform is less than that of third-party platform, namely ②<③.

From the above propositions, the conclusion is drawn that when manufacturers adopt different channel strategies, the cost of self built platform changes, the total sales volume of each channel will also changes. In overall, when the manufacturer invests only in the self built platform, the total sales volume is lower. When the cost of the self-built platform is less than the certain value, the total sales of the channel strategy that combining the self-built platform and the third-party platform will be higher. When the cost of the self-built platform is higher than the certain value, the total sales is higher when the manufacturer invests only in third party platforms. When the cost up to the certain value, compared with the self built platform, for manufacturers, to join the third party can obtain more profits. The channel strategy of combining the two is compared with the channel strategy that only joins the third-party platform, more to consider the relationship between λ and c, when c is within a certain range, λ is below a certain value, and the profit of joining the third party platform is higher.

According to the brand equity of the manufacturer, the channel strategy model is constructed. In this model, s is the brand effect of self-built platform when manufacturer considers brand equity (s may be more than 0 and less than 0, to simplify the calculation, the brand effect of the third party platform is omitted). β is the consumer's sensitivity to brand effect($0<\beta<1$). The new requirement functions of self-built platform and third-party platform are as follows:

$$\begin{cases} q_1 = \varepsilon - P + \beta s \\ q_2 = 1 - \varepsilon - P \end{cases} \tag{21}$$

The total market demand (Q) is as follows:

$$Q = q_1 + q_2 = 1 - 2P + \beta s \tag{22}$$

The profit of the manufacturers network channels on the self built platform (π_1) and third-party platform (π_2) are as follows:

$$\begin{cases} \pi_1 = (P-c)(\varepsilon - P + \beta s) - \dfrac{s^2}{2} \\ \pi_2 = P(1-\lambda)(1-\varepsilon-P) \end{cases} \tag{23}$$

The manufacturer pursues profit maximization, and the total profit (π) is as follows:

$$\pi = (P-c)(\varepsilon - P + \beta s) + P(1-\lambda)(1-\varepsilon-P) - \frac{s^2}{2} \tag{24}$$

The first derivative of the P is calculated for the total profit (π):

$$\begin{cases} \dfrac{\partial \pi}{\partial P} = \varepsilon + c + \beta s + (1-\lambda)(1-\varepsilon) - 2P(2-\lambda) \\ \dfrac{\partial \pi}{\partial s} = \beta(P-c) - s \end{cases} \tag{25}$$

Let the first derivative is 0, the results are as follows:

$$P = \frac{[\varepsilon + c + (1-\lambda)(1-\varepsilon) - \beta^2 c]}{2(2-\lambda) - \beta^2} \tag{26}$$

$$s = \frac{\beta[\varepsilon + (1-\lambda)(1-\varepsilon) - c(3-2\lambda)]}{2(2-\lambda) - \beta^2} \tag{27}$$

Substituting formula (26), (27) into formula (21), the results are as follows:

$$q_1 = \frac{(\beta^2 - 1)[\varepsilon + c + (1-\lambda)(1-\varepsilon) - \beta^2 c]}{2(2-\lambda) - \beta^2} + \varepsilon - c\beta^2 \tag{28}$$

$$q_2 = 1 - \varepsilon - \frac{[\varepsilon + c + (1-\lambda)(1-\varepsilon) - \beta^2 c]}{2(2-\lambda) - \beta^2} \tag{29}$$

The total market demand (Q) is:

$$Q = 1 - c\beta^2 + \frac{(\beta^2 - 2)[\varepsilon + c + (1-\lambda)(1-\varepsilon) - \beta^2 c]}{2(2-\lambda) - \beta^2} \tag{30}$$

The profits of each platform(π_1),(π_2)and total profit (π) are as follows:

$$\pi_1 = \frac{[c+\varepsilon+(1-\lambda)(1-\varepsilon)-c\beta^2][(1-\lambda)(1-\varepsilon)(\frac{1}{2}\beta^2-1)+(c+\varepsilon-c\beta^2)(3-2\lambda-\frac{1}{2}\beta^2)]}{[2(2-\lambda)-\beta^2]^2} - c\varepsilon + \frac{1}{2}c^2\beta^2 \tag{31}$$

$$\pi_2 = \frac{(1-\lambda)[c+\varepsilon+(1-\lambda)(1-\varepsilon)-c\beta^2][(1-\varepsilon)(3-2\lambda-\beta^2)+[c(\beta^2-1)-\varepsilon]]}{[2(2-\lambda)-\beta^2]^2}$$

(32)

$$\pi = \frac{1}{2}\frac{[c+\varepsilon+(1-\lambda)(1-\varepsilon)-c\beta^2]^2}{2(2-\lambda)-\beta^2} - c\varepsilon + \frac{1}{2}c^2\beta^2 \tag{33}$$

The following proposition can be obtained by formulas (27) :

Proposition 6 The brand effect (s)of self-built platform has a direct relationship with β. When the consumer's sensitivity to brand effect is enhanced, it will promote the self-built platform to enhance its brand effect and strengthen the brand construction.

The following proposition can be obtained by formulas (28), (29), (30).

Proposition 7 The total demand is directly related to the price(P) and the brand effect(s). When the price increases, the total demand will decreases.

When brand equity investment increases, and brand effect increases, total demand also rises. When the following condition is satisfied:

$$c < \frac{(2-\lambda)[\beta^2(1-\varepsilon) + 2(2\varepsilon - 1)]}{\beta^2(3-2\lambda)}$$

The sales volume of the manufacturer on the self-built platform is higher than the sales volume on the third party platform. The following proposition can be obtained by formulas (31), (32), (33):

Proposition 8 The total profit of the manufacturer is directly related to the price. The higher the price of the self-built platform, the greater the profit. When the following conditions are satisfied:

$$c \in (0, \frac{(1-\beta^2)(1-\lambda)(\lambda-\beta^2) - \varepsilon[(1-\beta^2)(8-5\lambda-2\beta^2) - (4-2\lambda-\beta^2)^2] - \sqrt{\Delta}}{(1-\beta^2)^2(8-6\lambda-\beta^2) + \beta^2(4-2\lambda-\beta^2)^2}), \ \Delta > 0$$

$$(1-\lambda+\lambda\varepsilon)(-4+2\lambda+\frac{3}{2}\beta^2) + \varepsilon(8-5\lambda-2\beta^2) > 0$$

Among them:

$$\Delta = (4-2\lambda-\beta^2)^2(1-\lambda)[\lambda\beta^2(1-\varepsilon)^2(8-4\lambda-3\beta^2) + 2\beta^2(6\varepsilon^2-9\varepsilon+4) + \lambda\varepsilon(2-6\varepsilon)]$$
$$+ (1-\lambda)^2(1-\beta^2)^2(1-\varepsilon)^2[4\beta^4 + \beta^2(20\lambda-32) + 25\lambda^2 - 80\lambda + 64]$$

or satisfies the condition as follow: $\Delta<0$

or satisfies the conditions as follows:

$$\Delta > 0, \ c > \frac{(1-\beta^2)(1-\lambda)(\lambda-\beta^2) - \varepsilon[(1-\beta^2)(8-5\lambda-2\beta^2) - (4-2\lambda-\beta^2)^2] + \sqrt{\Delta}}{(1-\beta^2)^2(8-6\lambda-\beta^2) + \beta^2(4-2\lambda-\beta^2)^2}$$

The profit of the manufacturer on the self built platform is more than the profit on the third party platform

Conclusion from the above propositions, when consumers are more sensitive to the brand effect, the platform needs to increase the investment in brand construction, which can attract consumers, and the total demand will rises. When manufacturers control the cost of self-built platforms within a certain range, sales volume will be greater than that of third-

party platforms, and profits will be higher than that of third-party platforms.

Numerical analysis: for a more intuitive representation, the sales and profit curves are plotted with Matlab2010. The influence of the main parameters (β,ε,c,λ) on manufacturer's online channel sales and profit is analyzed under the online channel strategy of the manufacturer based on brand equity. For the simple analysis, this paper only considers the changes of parameters (c,ε), and randomly sets β=0.5, λ=0.2, the range of values $c \in (0,2)$, $\varepsilon \in (0,1)$. Make the figures as follows:

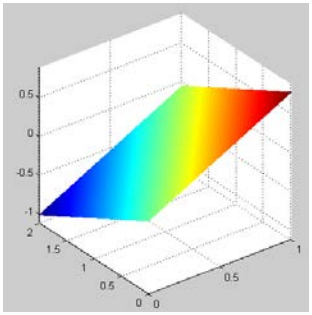

FIGURE VII. SALE CHANGE OF SELF-BUILT PLATFORM

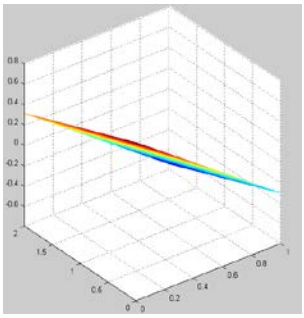

FIGURE VIII. SALE CHANGE OF THIRD-PARTY PLATFORM

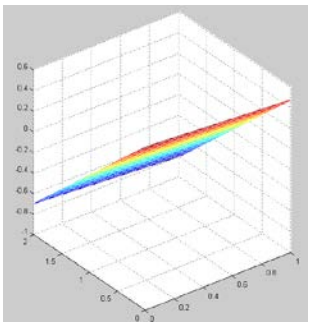

FIGURE IX. TOTAL DEMAND CHANGE

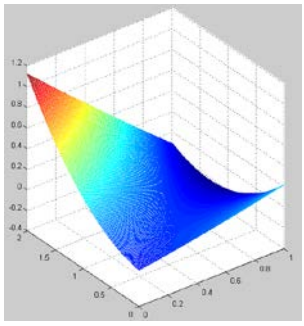

FIGURE X. PROFIT CHANGE OF SELF BUILT PLATFORM

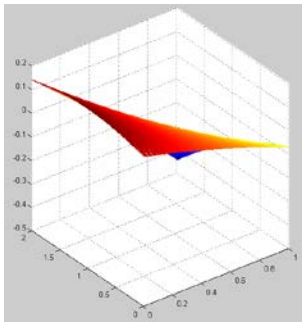

FIGURE XI. PROFIT CHANGE OF THIRD-PARTY PLATFORM

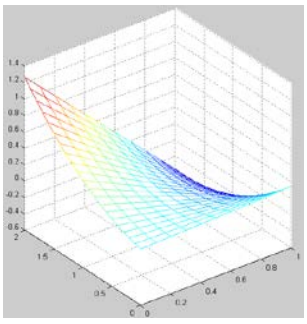

FIGURE XII. TOTAL PROFIT CHANGE

When ε=1, the market input volume of the manufacturer on the self built platform is 1, and the market input volume of the third party platform is 0. The requirement functions of self-built platform is as follow:

$$q_1 = 1 - P + \beta s \tag{34}$$

The total market demand (Q) is as follow:

$$Q = q_1 = 1 - P + \beta s \tag{35}$$

The profit of the manufacturer on the self built platform, namely the total profit:

$$\pi = \pi_1 = (P - c)(1 - P + \beta s) - \frac{s^2}{2} \tag{36}$$

The first derivative of P and s is calculated respectively for the total profit (π):

$$\begin{cases} \dfrac{\partial \pi}{\partial P} = 1 + c + \beta s - 2P \\ \dfrac{\partial \pi}{\partial s} = \beta(P - c) - s \end{cases} \tag{37}$$

Let the first derivative is 0, the result is as follows:

$$P = \frac{1 + c - \beta^2 c}{2 - \beta^2} \tag{38}$$

$$s = \frac{\beta(1-c)}{2-\beta^2} \tag{39}$$

$$Q = q_1 = \frac{1-c}{2-\beta^2} \tag{30}$$

$$\pi = \frac{(1-c)^2}{2(2-\beta^2)} \tag{41}$$

To facilitate analysis and comparison, the following table is made:

TABLE II. COMPARISON OF PRICE, SALES VOLUME AND PROFIT UNDER DIFFERENT CHANNEL STRATEGIES

Model result	Channel strategies		
	①Self-built and third-party platform	②Self-built platform	③ Third-party platform
P	$\frac{[\varepsilon + c + (1-\lambda)(1-\varepsilon)]}{2(2-\lambda)}$	$\frac{1 + c - \beta^2 c}{2 - \beta^2}$	$\frac{1}{2}$
s	$\frac{[\varepsilon + c + (1-\lambda)(1-\varepsilon) - \beta^2 c]}{2(2-\lambda) - \beta^2}$	$\frac{\beta(1-c)}{2-\beta^2}$	—
Q	$1 - c\beta^2 + \frac{(\beta^2 - 2)[\varepsilon + c + (1-\lambda)(1-\varepsilon) - \beta^2 c]}{2(2-\lambda) - \beta^2}$	$\frac{1-c}{2-\beta^2}$	$\frac{1}{2}$
π	$\frac{1}{2}\frac{[c + \varepsilon + (1-\lambda)(1-\varepsilon) - c\beta^2]^2}{2(2-\lambda) - \beta^2} - c\varepsilon + \frac{1}{2}c^2\beta^2$	$\frac{(1-c)^2}{2(2-\beta^2)}$	$\frac{(1-\lambda)}{4}$

The following propositions can be obtained from TABLE Ⅱ:

Proposition 9 When the manufacturer adopts different channel strategy, the following condition is satisfied: $c<\beta^2/2$, the total sales of channel strategy when only investing in self-built platform is greater than the total sales of channel strategy when only third party platform is invested, namely ②>③.

When the following condition is satisfied:

$$c < \frac{\beta^2(\frac{1}{2} - \lambda + \lambda\varepsilon) + \lambda - 2\lambda\varepsilon}{\beta^2(1 - 2\lambda) + 2}$$

The total sales of channel strategy when investing in self-built platform and the third-party platform is greater than the total sales of channel strategy when only third party platform is invested, namely ①>③. When the following condition is satisfied:

$$c < \frac{-\lambda(2 + \beta^4 - 2\beta^2) + \lambda\varepsilon(2-\beta^2)^2 + \beta^2}{8 - 2\lambda - 3\beta^2 - (2-\beta^2)\beta^2(7 - 2\lambda - 2\beta^2)}$$

The total sales of channel strategy when only investing in self-built platform is greater than the total sales of channel strategy investing in self-built platform and the third-party platform, namely ②>①.

Proposition 10 When the manufacturer adopts different channel strategy,the following conditions are satisfied:

$$c \in \left(0, \frac{2 - \sqrt{2(1-\lambda)(2-\beta^2)}}{2}\right) \quad or \quad c > \frac{2 + \sqrt{2(1-\lambda)(2-\beta^2)}}{2}$$

The profit of channel strategy when only investing in self-built platform is more than the profit of channel strategy when only third party platform is invested, namely ②>③. When the following conditions are satisfied:

$$\Delta < 0$$
$$\Delta = 4\left[(1-\lambda)(1-\beta^2) + \varepsilon[\lambda(3-\beta^2) - (4-\beta^2)]\right]^2 - 4[1 + 2\beta^2(1-\lambda)][(1-\lambda)(\frac{1}{2}\beta^2 + 2\varepsilon\lambda - 1) + \varepsilon^2\lambda^2]$$

or satisfies the conditions as follows:

$$\Delta > 0,\ c > \frac{2\varepsilon[(4-\beta^2) - \lambda(3-\beta^2)] - 2(1-\lambda)(1-\beta^2) + \sqrt{\Delta}}{2[1 + 2\beta^2(1-\lambda)]}$$

or satisfies the conditions as follows:

$$\Delta > 0,\ c \in \left(0, \frac{2[\varepsilon[(4-\beta^2) - \lambda(3-\beta^2)] - (1-\lambda)(1-\beta^2)] - \sqrt{\Delta}}{2[1 + 2\beta^2(1-\lambda)]}\right),\ (1-\lambda)(\frac{1}{2}\beta^2 + 2\varepsilon\lambda - 1) + \varepsilon^2\lambda^2 > 0$$

The total profit of channel strategy when investing in self-built platform and the third-party platform is more than the total profit of channel strategy when only third party platform is invested, namely ①>③. When the following conditions are satisfied:

$$\Delta > 0$$
$$\Delta = 4\left[(2-\beta^2)[(1-\lambda)(1-\beta^2) + \varepsilon[\lambda(3-\beta^2) - (4-\beta^2)] + 1] + 2(1-\lambda)\right]^2 - 8(1-\lambda)\left[\beta^2(2-\beta^2) - 1\right]\left[(1 - \lambda + \varepsilon\lambda)^2(2-\beta^2) - \left[2(2-\lambda) - \beta^2\right]\right]$$
$$c \in \left(0, \frac{-2\left[(2-\beta^2)[(1-\lambda)(1-\beta^2) + \varepsilon[\lambda(3-\beta^2) - (4-\beta^2)] + 1] + 2(1-\lambda)\right] - \sqrt{\Delta}}{4(1-\lambda)\left[\beta^2(2-\beta^2) - 1\right]}\right)$$

or satisfies the conditions as follows:

$$\Delta > 0,\ c > \frac{-2\left[(2-\beta^2)[(1-\lambda)(1-\beta^2) + \varepsilon[\lambda(3-\beta^2) - (4-\beta^2)] + 1] + 2(1-\lambda)\right] + \sqrt{\Delta}}{4(1-\lambda)[\beta^2(2-\beta^2) - 1]}$$

The total profit of channel strategy when investing in self-built platform and the third-party platform is less than the profit of channel strategy when only self-built platform is invested, namely ①<②.

From the above propositions, it is concluded that when the manufacturer adopts different channel strategies, the smaller the cost of self-built platforms, the larger the total sales volume of the self-built platforms. If manufacturers can control their own costs, they will have bigger total sales and more gross profits. At this point, it is unwise to only invest the third party platform, self-built platform is more suitable for investment.

III. CONCLUSION

Based on the model construction, this paper obtains multiple propositions and conclusions. In the basic model, when the manufacturer does not consider the investment of brand assets, the total sales volume and gross profit of each channel have a great relationship with the cost of the self built platform and the market input volume. With the increase of the market input volume of one party, the sales volume and profit of the corresponding platform will increase. Overall, the total sales is low when the manufacturer only invest in the self-built platform. When the cost of self built platform is high, the total sales will be higher when only invest third party platform. When the cost up to a certain value, compared with the self built platform, for manufacturers, to join the third party can get more profit. For manufacturers, without considering brand assets, the most appropriate channel strategy is to join the third party.

When manufacturers consider brand equity, with the increasing sensitivity of consumers to brand effect, the platform will increase the investment in brand construction to attract consumers and promote the rise of demand. If manufacturers can control the cost of self-built platform in low range, the total sales will be larger when only invest self-built platform, and total profits will be more. At this point, it is unwise to only invest the third-party platform, self-built platform is more suitable for investment.

ACKNOWLEDGMENT

This research work is partially supported by the National Natural Science Foundation of China (No.71372120).

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