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Research of Luxury Online Shopping Channel Conflict and Coordination Mechanism

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***Abstract*—The luxury online shopping attracts more and more attention of consumers, which makes the luxury brands have to pay attention to the influence of the electronic channels, but for the sensitive price system as well as the traditional agency model, triggering a series of channel conflict. In this paper, for this phenomenon, we use the theory of consumer utility to develop the model assumptions, and use the methods of linear programming, which derived the demand for products of the traditional channels and electronic channels. and then discuss the pricing strategy to maximize its profits, combined with the previous study about the introduction of consumer acceptance of the luxury online shopping, we call it θ, as well as the opportunity cost of consumer products purchased in the traditional retailers coefficient t, explore the comparison of the profit of the supply chain in the case of threshold, finally put forward the coordination mechanisms to the conflict phenomenon.**

Keywords—luxury goods; e-commerce; channel conflict; coordination mechanisms

I. INTRODUCTION

Sales of luxury goods in China totaled about 1 trillion yuan in 2017, according to McKinsey's June 2017 report on Chinese luxury goods. The traditional luxury channel mostly adopts the mode of brand agent, which is limited by the high price and high quality of luxury goods and its target audience is limited to the specific people with high income and high grade. With the popularity of the Internet, the development of e-commerce has changed people's shopping habits, gradually challenging those seemingly impossible to appear on the network of luxury goods; it caters to a group of price-sensitive consumers with a strong demand for luxury goods, mostly young people in pursuit of fashion. However, judging from the "Tiansuo" incident in Dangdang and the "Swarovski" incident by JingDong, the price system of the network channel and the traditional channel has been interfered with, and the e-commerce business has been pushed to the forefront of the storm, which has been questioned and condemned by the brands. The brands say they do not provide after-sales service to fight back, which ultimately hurt the interests of consumers and make the consumer become the victim of the channel conflict between the luxury brand and the e-commerce. To explore the essential reason of this phenomenon is that luxury goods directly authorized by the non-brand merchants flow directly from the network channel to the terminal crowd, which impacts the interests of the physical stores. From the perspective of the brands, this kind of online shopping channel that is difficult to stop always exists. And China's luxury goods market is young and dynamic, and the average audience is between 25 and 35 years old. This part of the population has a great overlap with those who like to buy online. From this perspective, luxury goods online shopping has certain potential and feasibility. When a certain degree of scale is bound to stage a similar conflict of interest, the mixed multi-channel strategy is mostly adopted by the manufacturing industry and has been successful [1], for example, many world-renowned enterprises, such as HP, IBM, and so on, at the same time, Some manufacturers have closed online stores in order to reduce conflicts with traditional retailers, such as LEVIS [2]. This problem of channel structure and channel conflict in a multi-channel environment has attracted widespread attention from both business and scholars. Whether to adopt the mixed multi-channel strategy becomes the problem that every luxury brand will face in the future. However, in the traditional luxury sales channel, the product from brand to channel, and finally to the customer, the nature of the agent gradually changed from the original commission model to an economy independent of the brand. Both sides aim to maximize their own interests, which leads to the classic problem of double marginalization [4]. Many literatures have studied the coordination and incentive between manufacturers and distributors in traditional single distribution channels. However, in the traditional luxury sales channel, the product from brand to channel, and finally to the customer, the nature of the agent gradually changed from the original commission model to an economy independent of the brand. Both sides aim to maximize their own interests, which leads to the classic problem of double marginalization [4]. Many literatures have studied the coordination and incentive between manufacturers and distributors in traditional single distribution channels, which have put forward many kinds of contract forms, such as wholesale contract, income division contract and so on, which can realize the coordination of supply chain [5], but the multi-channel problem under the environment of electronic commerce has only been paid attention to by researchers in recent years. However, most of the researches are for manufacturers and retailers, and rarely involve the research of brands, agents and e-commerce. Therefore, it is of

theoretical and practical significance to study the channel strategy of luxury goods from the perspective of brands.

II. RESEARCH STATUS AT HOME AND ABROAD

In recent years, there have been a lot of literatures on the price strategy of dual channels under the environment of electronic commerce. Relatively speaking, foreign research started earlier, Friberg et al (2000 / 2001) established a theoretical model of the price relationship between traditional stores and online stores, and made an empirical test using the books in the Swedish market and the electronic commerce data of music CD. He pointed out that the online price of a pure online store (a store that sells goods only through Internet) is lower than the online price of a dual-channel store (Stores that can sell goods through both Internet and traditional methods)[6]; A retailer that combines e-commerce and traditional commerce with each other. Pan et a1 (2002) established a price competition game model between a pure e-commerce retailer and a retailer that combines e-commerce and traditional commerce with each other based on the Hotelling model framework. He pointed out that the price of a pure e-commerce retailer is usually lower than that of a retailer with a combination of e-commerce and traditional commerce [7]; Cai Jin and Zhang Zhenghua (2001) used game theory and information economics theory to analyze the price competition behavior of e-commerce retailers and traditional retailers. Combined with the current situation of developing electronic commerce in China, some policy suggestions are given[8] ; Chen Yun and others have studied the optimal pricing and equilibrium profit of e-commerce retailers and traditional retailers under the competition of two channels[9] ; Wang Hong et al discussed the conditions of direct marketing channel, pricing of channel and coordination of wholesale price contract of supply chain in view of the double channel supply chain where suppliers are risk-averse[10]。However, there are few studies on the coordination of the supply chain of luxury goods, most of which are confined to the study of the consumption profile of luxury goods, the study of consumer shopping psychology and the development trend of luxury goods and so on. Li Zaiyong, Li Hua (2005) [11], in the discussion of luxury consumption-related issues, it mainly introduced the definition of luxury goods scope, the determination of price, the collection and management of taxes, etc. The demand price elasticity of luxury goods is greater than 1, and the income elasticity of demand is the degree of response of commodity demand to the change of consumer income, that is, the income elasticity coefficient of demand. Income elasticity greater than 1 indicates that commodities have high income elasticity, and then they are called luxury goods or high-grade commodities. Zhu Xiaohui (2006) [12] reviewed the research on the consumption motivation of luxury goods in East and West, and its cultural background, and pays special attention to the influence of Confucian culture on consumers in East Asia. He made an empirical analysis of the luxury consumption motivation of Chinese consumers and divided it into social consumption motivation (show off, conformity, social, status symbol) and personal consumption motivation (fine quality, self-enjoyment, self-gift); Peng Chuanxin (2010) [13] the research on luxury brand culture expounded the commonness of luxury brand culture from two aspects: product characteristics and marketing. At the same time, he divided the personality of luxury brand culture into four dimensions by time and innovation, and put forward the "triangle theory" analysis method of luxury marketing strategy; Deng Di (2011) [14] Evaluation of the Development potential of luxury goods Market in China's second-tier cities. Deng Di selected five second-tier cities and established a comprehensive evaluation index system of the development potential of the luxury goods market in each city, and evaluated the development potential of the luxury goods market in each city. The results showed that the factors affecting the development potential of luxury goods market include economic, social, demographic and environmental factors. He found that the second-tier city luxury development potential is huge, will play a leading role. Therefore, it is significant to study the appearance of luxury online shopping and the associated channel conflicts.

III. MODEL HYPOTHESIS AND PARAMETER SETTING

Assuming that the consumer's valuation of the same commodity is different, called willingness to pay, expressed in v, for simplified analysis, assuming that v is uniformly distributed across the range [0 / 1], the retailer's price is Pr, t is the opportunity cost coefficient [15] that the consumer buys in the traditional channel, then the customer will get the consumer surplus as v-tv-P; assuming that the goods are sold only through traditional channels, consumers will choose to buy if their surplus value is greater than or equal to zero, that is v-tv-Pr$\geq$0, that is, valuation of products v$\geq \frac{\Pr}{1-t}$, the threshold is no different for consumers to buy or not to buy, consumers with a willingness to pay between $\left[\frac{\Pr}{1-t},1\right]$ will buy. The product demand of traditional channels is: Qr=1-$\frac{\Pr}{1-t}$, ($0 \le \Pr \le 1$).

If brands open up electronic sales channels, introduce θ [16], which represents consumer acceptance of direct marketing channels(0<θ<1), Pe expresses the selling price of the electronic channel, generally determinable $\Pr \ge Pe$, Due to the convenience and cost of the Internet to consumers, consumer valuation of electronic channel products is θv, Relative to the cost of traditional retailers, to simplify the calculation, electronic channel shopping costs and so on neglect, that is, the surplus value of goods purchased by consumers in e-commerce channels is θv-Pe, in the same way, when the consumer's surplus is greater than or equal to zero, the transaction takes place, that is v $\geq \frac{Pe}{\theta}$. When the consumer surplus under both channels

is equal, that is, when $Vre = \frac{\Pr - Pe}{1-t-\theta}$, consumers for the two channels of purchase is no difference.

$$\begin{cases} Ur = v - tv - \Pr \\ Ue = \theta v - Pe \end{cases} \longrightarrow \begin{cases} Vr \geq \frac{\Pr}{1-t} \\ Ve \geq \frac{Pe}{\theta} \end{cases}$$

When $Ur \geq 0$, Rational consumers choose to buy products through traditional channels, that is, existence critical value $Vr = \frac{\Pr}{1-t}$; when $Ue \geq 0$, rational consumers choose to buy products on electronic channels, critical value $Ve = \frac{Pe}{\theta}$; when Ur=Ue, there is no difference in which channel consumers choose to buy, $Vre = \frac{\Pr - Pe}{1-t-\theta}$.

IV. Price Strategy Under Single Traditional Channel

Assuming that consumers are evenly distributed across the range, $[0,1]$, Assuming that consumers are evenly distributed across the range, demand function $Qr=1-Vr=1-\frac{\Pr}{1-t}$, wholesale price is w; if the brand acts as the price leader of Stank Berg and sets the wholesale price before the retailer sets the price, the retailer regards the wholesale price as exogenous, and according to the profit function of the retailer, the maximum profit is calculated through the price. The brand expects a reaction from the retailer, that is, according to the retailer's price strategy to maximize their own profits, expressed as:

The profits of the brands are

$$\max \pi b = w*Qr = w*\left(1-\frac{\Pr}{1-t}\right) \quad (1)$$

$$\text{S.t. } \max \pi a = (\Pr - w)*\left(1-\frac{\Pr}{1-t}\right) \quad (2)$$

Based on reverse induction

$\Pr = \frac{3(1-t)}{4}$, $w = \frac{1-t}{2}$, $Qr = \frac{1}{4}$, $\pi b = \frac{1-t}{8}$, $\pi a = \frac{1-t}{16}$

If the two enterprises are vertically integrated, the total profit of the supply chain

$$\pi s = P*\left(1-\frac{P}{1-t}\right) \quad (3)$$

Partial derivation of price for equation (3), $1-\frac{2P}{1-t}=0$,

to get: $P = \frac{1-t}{2}$, $Q = \frac{1}{2}$, $\pi s = \frac{1-t}{4}$

And profits under decentralized decision-making $\pi b+\pi a = \frac{3(1-t)}{16} < \pi s$

Each enterprise tries its best to maximize its own profit. As a result, the price of the product is higher and the sales volume and profit are lower than in the case of vertical integrated channel, thus becoming a typical double marginalization effect. (Spengler 1950)[17].

V. Price Strategy and Game Equilibrium Under Double Channels

Faced with the situation of dual channels, rational consumers will first judge whether the residual value after purchase is greater than or equal to zero, and then determine which channel to buy the larger residual value. The demand function of each channel is deduced by comparing the critical value of transaction. The derivation is as follows:

$$Vr - Ve = \frac{\Pr}{1-t} - \frac{Pe}{\theta} = \frac{\theta \Pr - Pe(1-t)}{\theta(1-t)} \quad (4)$$

$$Vr - Vre = \frac{\Pr}{1-t} - \frac{\Pr - Pe}{1-t-\theta} = \frac{(1-t-\theta)\Pr - (1-t)(\Pr - Pe)}{(1-t)(1-t-\theta)} = \frac{Pe(1-t) - \theta \Pr}{(1-t)(1-t-\theta)} \quad (5)$$

$$Ve - Vre = \frac{Pe}{\theta} - \frac{\Pr - Pe}{1-t-\theta} = \frac{(1-t-\theta)Pe - \theta(\Pr - Pe)}{(1-t-\theta)\theta} = \frac{(1-t)Pe - \theta \Pr}{(1-t-\theta)\theta} \quad (6)$$

Considering the results of the three equations (4) (5) (6), we can find that the denominator is greater than zero, and the molecules are just positive and negative sign uncertainty, so when $\Pr > \frac{(1-t)Pe}{\theta}$, the critical value relation obtained is Ve<Vr<Vre, conversely, when $\Pr < \frac{(1-t)Pe}{\theta}$, the critical value relation is Vre<Vr<Ve , the distribution of the demand function of the two channels in different regions is as follows:

$$Qr=\begin{cases}1-\dfrac{\Pr}{1-t}\\ 1-\dfrac{\Pr-Pe}{1-t-\theta}\end{cases}$$, the corresponding ranges are

$$\Pr\le\frac{(1-t)Pe}{\theta}$$

$$\frac{(1-t)Pe}{\theta}\le\Pr\le Pe+1-t-\theta \tag{7}$$

When there is no difference between the two channels, the consumer's surplus is less than zero, and there is no purchase at this time. When the consumer's evaluation of the goods reaches the critical value of Vr, it is through traditional channels that demand is generated, That is, the consumer surplus of the electronic channel in the $[Vr,Ve]$ interval is still less than zero, and no demand is generated, Until $Ve=\dfrac{Pe}{\theta}$, $Ue=0$, when $Vr<\dfrac{\Pr-Pe+\theta Ve}{1-t}$, electronic channels generate demand, this moment $Ue>Ur>0$.

$$Qe=\begin{cases}\dfrac{\Pr-Pe}{1-t-\theta}-\dfrac{Pe}{\theta}\\ 0\end{cases}$$, the corresponding ranges are

$$\frac{(1-t)Pe}{\theta}\le\Pr\le Pe+1-t-\theta$$

$$\Pr\le\frac{(1-t)Pe}{\theta} \tag{8}$$

When the consumer valuation meets $Ve=\dfrac{Pe}{\theta}$, electronic channels generate demand, traditional channels demand zero, when $Vr=\dfrac{\Pr}{1-t}$, $Ur\ge0$, but $Vr<Vre$, that is, the consumer surplus of the traditional channel is smaller than the surplus value of the electronic channel, and rational consumers will choose the electronic channel, till $Vre=\dfrac{\Pr-Pe}{1-t-\theta}$, there is no difference between the two channels, and in the range $[Vre,1]$, consumers will choose to buy on traditional channels.

A. *The Price Strategy of Retailers Under Double Channels*

Given the brand's electronic channel price Pe and wholesale price w, retailers choose the best price Pr to maximize their own profits, that is $\max \pi a=(\Pr-w)Qr-C$, based on the expression of the requirement function, the following propositions can be obtained:

In Proposition 1, when Brand Merchants Electronic Channel Price Pe and Wholesale Price w are given, the retailer's optimal pricing strategy is as follows:

$$\max \pi a=(\Pr-w)Qr-C$$

$$=\begin{cases}(\Pr-w)\left(1-\dfrac{\Pr}{1-t}\right)-C\\ (\Pr-w)\left(1-\dfrac{\Pr-Pe}{1-t-\theta}\right)-C\end{cases} \tag{9}$$

The equation in (9) is derived separately, get

$$\Pr=\begin{cases}\dfrac{1-t+w}{2} & (\Pr,w)\\ \dfrac{1-t-\theta+w+Pe}{2} & (\Pr,w)\end{cases}$$

$$w<\frac{2(1-t)Pe}{\theta}+t-1$$

$$\frac{2(1-t)-\theta}{\theta}Pe+t+\theta-1<w<Pe+1-t-\theta \tag{10}$$

B. *The Price Strategy of Brands Under Double Channels*

In Proposition 2, there is a critical value $\tilde{\theta}=\dfrac{15(1-t)}{11}$, so when $\theta\ge\tilde{\theta}$, the brand will use two channels to sell the product, both channels have positive demand, the brand's optimal price strategy is: $w=\dfrac{1-t}{2}$, $Pe=\dfrac{\theta}{2}$, $\Pr=\dfrac{3(1-t)-\theta}{4}$

The profits of both parties are as follows: $\pi b^{d}=\dfrac{19-19t-11\theta}{32}$, $\pi a^{d}=\dfrac{1-t-\theta}{16}$,

When $\theta<\tilde{\theta}$, brands open up electronic channels, but the electronic channel does not produce the demand, only the

traditional channel has the demand. The best price strategy for the brand is: $w=\frac{1-t}{2}$, $\frac{3(1-t)}{4}$

The profits of both parties are as follows: $\pi b^d=\frac{1-t}{8}$, $\pi a^d=\frac{1-t}{16}$

It proves, based on retailer's optimal price strategy Pr(Pr, w), brand merchants maximize their profits, that is $\max \pi b^d = PeQe + wQr$

Then when $\Pr \le \frac{(1-t)Pe}{\theta}$,

$$\max \pi b^d = w\left(1-\frac{\Pr}{1-t}\right)$$

$$s.t.\Pr=\frac{1-t+w}{2} \quad (11)$$

Reverse induction method $w=\frac{1-t}{2}$, $\pi b^d=\frac{1-t}{8}$

When $\frac{(1-t)Pe}{\theta} \le \Pr \le Pe+1-t-\theta$, the objective functions and constraints are:

$$\max \pi b^d = w\left(1-\frac{\Pr-Pe}{1-t-\theta}\right)+Pe\left(\frac{\Pr-Pe}{1-t-\theta}-\frac{Pe}{\theta}\right)$$

$$s.t.\Pr=\frac{1-t-\theta+w+Pe}{2} \quad (12)$$

Simplified by classics

$$\pi b^d=\frac{(Pe-w)(1-t-\theta+w-Pe)}{2(1-t-\theta)}-\frac{Pe^2}{\theta}$$

Respectively calculate the partial derivatives of w and Pe,

$$\begin{cases} 1-\frac{Pe-(1-t-\theta)-2w+Pe}{2(1-t-\theta)}=0 \\ \frac{1-t-\theta+w-2Pe+w}{2(1-t-\theta)}-\frac{2Pe}{\theta}=0 \end{cases}$$ to get

$$\begin{cases} w=\frac{1-t}{2} \\ Pe=\frac{\theta}{2} \end{cases}$$

$$\pi b^d=\frac{19-19t-11\theta}{32}$$

VI. Equilibrium Analysis and Coordination Strategy

Inference 1: While maintaining the retail channel, the brand company opens up the electronic direct selling channel, and the profit from the mixed multi-channel strategy will not be reduced, at least the profit of the original channel will be the same.

Prove: when $\theta > \tilde{\theta}$,

$$\pi b^d-\pi b^s=\frac{19-19t-11\theta}{32}-\frac{1-t}{8}=$$

$$\frac{15-15t-11\theta}{32}>\frac{15(1-t-\theta)}{32}>0$$

When $\theta \le \tilde{\theta}$, $\pi b^d-\pi a^s=\frac{1-t}{8}-\frac{1-t}{8}=0$

With the rapid development and popularization of the Internet, the online shopping habits of Internet users are well cultivated, and consumers' acceptance of the network is increasing. At this time, brands should not ignore this factor of change, compared with the high cost of traditional channels; online shopping costs are relatively low, negligible. By adopting a mixed dual channel strategy, brands attract some consumers with high online shopping habits and are more sensitive to price, while others who have high opportunity cost in traditional channels to shop online, thus expanding the market scope. This increases the overall market demand, which in turn increases the overall profits of the brands. When online shopping habits are low, consumers do not buy goods easily, reflecting higher online purchase costs, which may be due to considerations about the safety of online shopping, or uncertainty about product quality, and so on. However, consumers can still browse the commodity information through the online channel, consumers' shopping evaluation, etc. Although the electronic channel may not take place the actual purchase behavior, but the traditional market profit will not be affected.

Inference 2: Brands adopt a mixed dual channel distribution strategy, which makes the total profit of supply chain more than that of single channel decentralized decision.

Prove:

When $\theta \ge \tilde{\theta}$, the difference between the total profit of double channel supply chain and the profit of single dispersed channel is:

$$\Delta\pi = \pi s^d - \pi b = \frac{23-23t-11\theta}{32} - \frac{1-t}{8}$$

$$= \frac{19-19t-11\theta}{32} > 0$$

The difference between the profit of double channel supply chain and the total decision profit of single channel concentration is as

$$\Delta\pi = \pi s^d - \pi = \frac{23-23t-11\theta}{32} - \frac{1-t}{4}$$

$$= \frac{15-15t-11\theta}{32} > 0$$

follows:

When $\theta < \tilde{\theta}$, $\Delta\pi = \frac{1-t}{8} - \frac{1-t}{8} = 0$

$$\Delta\pi = \frac{1-t}{8} - \frac{1-t}{4} = -\frac{1-t}{8} < 0$$

When $\theta \geq \tilde{\theta}$, the total profit of the double channel supply chain is larger than that of supply chain under the condition of single channel decentralization and centralized decision;

When $\theta < \tilde{\theta}$, the total profit of double channel supply chain is smaller than that of single channel centralized decision.

Therefore, the shift of consumers' shopping habits makes the brands always have the power to open up electronic channels, adopt the dual channel strategy to increase the profit of the brands themselves, and at the same time make the profit of the supply chain increase compared with the single channel decentralized decision. But the general situation can damage the retailer's profit, thus causes the channel conflict. If the brand does not adopt the coordination strategy, it will lead to the emergence of the retailers' boycott of the brand, the decline in the level of promotional efforts and so on, which will eventually lead to the breakdown of the channel relationship, and at the same time, It is also impossible for the brands to sell their products only through electronic channels, and the profits are not maximized. Therefore, the brands can, through an effective coordination mechanism, induce the retailers to accept the dual channel strategy of the brands and increase the profits of both sides. Finally, a win-win situation is reached.

VII. CONCLUSION AND COUNTERMEASURES

To sum up, compared with a single channel, the total profit of the mixed channel supply chain will not be reduced, but it will affect the interests of the retailer. Meanwhile, the online shopping of luxury goods has become a basic trend, and the network can also create a scarcity of luxury goods. In order to avoid causing price conflicts while opening up e-commerce channels, brands should make several efforts:

A. Style Aspect

Luxury brands rely heavily on traditional retailers. A good partnership can ensure the maximum total profit in the supply chain, and at the same time fully assess consumers' online shopping habits in different periods and combine the characteristics of luxury goods themselves. The introduction of proprietary models to supply e-commerce channels to avoid direct conflict with retailers, while winning luxury consumers with high online shopping habits;

B. Price Aspect

The main source of channel conflict lies in the confusion of price system. Brands can control the wholesale price w to ensure the profit of the channel vendor and maximize the profit from the overall point of view of supply chain by the form of contract.

C. Aftermarket Aspect

Considering the problem of maintaining the brand image of luxury goods, brands can also distinguish consumers' price preference and comparison by designing products of different styles, because the after-sales service of electronic channels is more difficult. Brands can authorize agents to provide after-sales service to obtain additional profits to compensate for the loss caused by channel conflicts.

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