

# Research on Collaborative Strategy of Dual-Channel Supply Chain System for Product and Service Selection Driven by Experiential Demand

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**Abstract:** With the intensification of dual-channel competition, manufacturers are increasingly inclined to invest in offline showroom services to improve consumers' shopping experience, making it an emerging trend. Based on this background, this paper makes an in-depth study of how manufacturers choose the business strategy of physical showrooms in the dual-channel e-commerce environment, discusses the advantages and disadvantages of different service models, and analyzes the impact of these choices on consumer behavior and market competition. Through this research, this paper aims to provide valuable strategic suggestions for manufacturers to optimize their dual-channel service models. Four Stackelberg game models are constructed: 1) no service model (N), 2) manufacturers invest in service online products (MSM), 3) retailers invest in services online products (RSM), and 4) retailers invest in services online products (RSR). Then the optimal decision under the above four strategies is compared and analyzed, and the optimal choice of the manufacturer and the optimal service model of the whole supply chain are obtained.

**Keywords:** Dual Channel Supply Chain; Channel Service; Showroom Experience.

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## 1. Introduction

In recent years, with the rapid development of Internet e-commerce, people's consumption concepts and behaviors have undergone great changes. They are no longer confined to online or offline channels, but according to their respective shopping needs, purchase desires alternately appear in online and offline channels. To cope with such changes in purchase needs, online manufacturers have expanded the original single channel and opened offline stores. The online entry threshold is lower, the trouble cost is lower, and the offline store has stronger experience and can better understand the product.

Therefore, physical retail stores and online manufacturers have obvious characteristics and advantages in terms of channels. It is precisely because of consumers' recognition of new forms such as scene sales in physical stores and virtual online sales that channel competition intensifies. In the face of threats and challenges, how to give full play to online and offline advantages and improve the cooperation level of supply chain members?

Based on the heterogeneity of channel products, this paper further discusses the influencing factor of offline service effort, hoping to find more effective service effort strategies to improve the service level of the supply chain, ease channel competition, and enhance the performance of the entire supply chain.

## 2. Literature Review

In recent years of research, Dan L [1] (2023) studied the pricing decision of dual-channel supply chain considering consumer preference and cooperative emission reduction under carbon tax policy. G.S[2](2010) studied channel selection and coordination in dual channel supply chain. Based on the analysis of the role of online evaluation, Jingyu Xu[3](2023) established a supply chain decision-making model considering online review. In the case of decentralized

decision-making, whether the supply chain decision-making considering online review can bring better results is discussed. It is concluded that when online review is better, channel profits will increase and there will be a positive moderating effect. CAOEB[4](2021) studied the dual channel optimal decision under mass effect. Mengli Li[5](2023) made a research review and outlook on O2O supply chain management. Fang Li[6](2022) studied the impact of retailer's dual-channel strategy on manufacturer intrusion. Mingxing Xu[7](2022) studied the unified pricing and service decision of dual-channel supply chain under two-way free-riding behavior. Zhang[8](2020) and Konur[9](2021) discussed the influence of showroom effect on pricing of supply chain members in dual-channel supply chain. Liang Jin[10] (2017) considered showroom behavior and cross-selling behavior, establish a principal-agent model between online retailers and offline retailers, and design commission contracts. Can Li[11](2018) designed a coordination strategy based on offline demand guidance, and use the showroom effect to adjust the profit distribution ratio of supply chain members; Meiling Luo[12](2011) studied the phenomenon of service overflow under the dual-channel supply chain. Yu Cao[13](2021) studied of the effects of pre-service efforts, free-riding behavior, and online channel patterns in physical store promotions on manufacturers' pricing and service decisions.

Although the research on service effort coordination has been relatively rich, it mainly focuses on the single-channel sales model, and the service research under the phenomenon of dual-channel exhibition hall is not perfect. In this paper, under the dual-channel structure, the service strategy selection is further studied.

## 3. Model Framework

The background of our model is a two-channel supply chain, there is an online manufacturer (M, hereinafter referred to as the manufacturer) through the sale of experiential

products in offline retail stores (R, hereinafter referred to as retailers), while the online channel distribution and offline channel heterogeneous alternative products, It is denoted by the parameter  $\delta(0<\delta<1)$ ,The larger the parameter, the more substitutable the product, and manufacturers work with retailers to establish physical showrooms, taking into account that consumers cannot inspect the product. Under this sales model, consumers experience the manufacturer's products in a retailer's store, which is considered a physical showroom for the manufacturer.

### 3.1. Experiential Products and Services

The products sold by the manufacturer belong to the products with strong experience attributes, which need to go to the offline experience before purchase, because this type of product is more for consumers to feel, try or observe to ensure the quality, applicability, and performance of the product. For example, furniture and home decor often need to be observed and tried in a physical store to ensure that their appearance, texture, and size match the individual's home decor style. For example, due to factors such as size, cut, fabric and comfort, many consumers prefer to try on clothing and footwear in physical stores to ensure that it meets their personal needs and tastes. For some of the more expensive or complex electronic products and household appliances or new generation products, consumers usually want to observe and try in the physical store, get the sales staff to explain the introduction, to understand its function, performance, and operation mode and so on.

Therefore, the establishment of offline stores and the efforts of offline service level are very important, not only to display and sell products, but also to increase brand awareness and product exposure, improve sales opportunities, provide better customer experience, strengthen the relationship with consumers, promote cross-channel sales, and improve the overall performance of the supply chain. Sales personnel need to have a rich product knowledge reserve to answer customers' questions about products and guide consumers to buy.

First, due to the differences in the background of the two channels and channel products, service investment is targeted, and serving this channel will have a positive promoting effect on this channel, and service providers will have to bear the corresponding service costs. Therefore, service cost bearers are faced with a choice between manufacturers and retailers, which is different from the store advantages of offline retailers. When online manufacturers display their products, they also need to pay an extra cost for display. Therefore, according to the hypothesis of economic rational man, online manufacturers only provide services for online channels, while offline retailers, as the terminal of the supply chain, have a better understanding of the service preferences of consumers with experiential demands and have natural service advantages. Offline retailers not only have a discount factor  $\theta(0 < \theta < 1)$  for service costs. But also, the service object is faced with the choice between serving online channel products or serving offline channel products.

Considering the above requirements, the research model in this paper is divided into: (1) no service provision (N-type); (2) Manufacturers invest in offline services and service online channels (MSM-type); (3) Retailers invest in offline services and service offline channels (RSR-type); (4) Retailers invest in offline services and service online channels (RSM-type).

### 3.2. Features of Customers

The consumers studied in this paper are subdivided into experiential consumers, which refers to consumers who pay attention to consumption experience, feelings, and personalized needs. They pay more attention to the value provided by the product or service, such consumers are more willing to spend extra money to get a unique experience, and they usually tend to buy products or services that can provide a rich, unique, and satisfying consumption experience. Brands and retailers typically target this consumer segment with services such as personalized shopping experiences, special events, immersive brand experiences, and engagement with social media to engage them and increase their loyalty. For example, Nike's custom sports shoes service, IKEA's home furnishings experience, holding decoration workshops and home design consulting activities to provide inspiration and advice services for customers. Lululemon's Yoga Experience center provides customers with free yoga classes and fitness activities.

Manufacturers sell products online at prices  $p_m$  and set wholesale price  $w$  to retailers, and offline retailers sell products at prices  $p_r$ . After experiencing the product, consumers are faced with two choices of shopping channels: (1) buying offline alternatives online after the exhibition hall; (2) Direct offline purchase of retailer products.

First, in the N scenario where offline service is not provided, experiential consumers first go to the physical store to experience the product and obtain the utility value  $v$  of the product, and  $v$  follows the [0-1] distribution. If consumers choose offline shopping behavior, get utility  $u_r^N = v - p_r^N$ , If consumers choose online shopping behavior, due to the uncertainty of online shopping  $\xi(0 < \xi < 1)$  and product differences  $\delta(0<\delta<1)$ , get utility  $u_m^N = \delta\xi v - p_m^N$ . Second, in the MSM scenario where the manufacturer invests in the service and serves the online channel, the consumer goes to experience the product, and the consumer who decides to return to the online purchase receives services such as further product details from the sales staff  $ke_m$ , where  $k$  indicates the service sensitivity coefficient, The more dependent a product is on services such as personal introductions, the greater the coefficient  $k$ , and the higher the utility the same consumers get, get utility  $u_m^{MSM} = \delta\xi v - p_m^{MSM} + ke_m^{MSM}$ . Consumers who decide to buy in offline channels get utility  $u_r^{MSM} = v - p_r^{MSM}$ . Third, in the RSR scenario where retailers invest in offline services and serve offline channels, consumers who go to experience products and decide to return to online purchases get utility  $u_m^{RSR} = \delta\xi v - p_m^{RSR}$ . Consumers who decide to buy offline receive services such as further product details from sales staff  $ke_r$ , get utility  $u_r^{RSR} = v - p_r^{RSR} + ke_r^{RSR}$ . Fourth, in the RSM scenario where retailers invest in offline services and serve online channels, consumers go to experience the product and decide to return to the online purchase to get further detailed product introduction and other services from the sales staff  $ke_m$ , consumers who switch back to online purchases get utility  $u_m^{RSM} = \delta\xi v - p_m^{RSM} + ke_r^{RSM}$ . Consumers who still buy offline get utility  $u_r^{RSM} = v - p_r^{RSM}$ . Set superscript  $(i = N, MSM, RSR, RSM)$  denote four different scenarios, subscript  $(j = m, r)$  denote that the variables are determined by different channels of manufacturers and retailers.

### 3.3. Demand and Profit

Using the above product characteristics and consumer

characteristics, we define the utility function of consumers with different purchasing behaviors, if each consumer does not purchase more than one product. Then we can further obtain the demand function for each channel and construct the profit function for the supply chain members.

First, in the no-service scenario, when  $U_m^N > \max\{U_r^N, 0\}$ , consumers choose online channels to purchase, and the demand function is  $q_m^N$ , profit is  $\pi_m^N$ , when  $U_r^N > \max\{U_m^N, 0\}$ , consumers choose offline channels to purchase, and the demand function is  $q_r^N$ , profit is  $\pi_r^N$ :

$$q_m^N = \frac{p_r^N - p_m^N}{1 - \delta\xi} - \frac{p_m^N}{\delta\xi} \quad (1)$$

$$q_r^N = 1 - \frac{p_r^N - p_m^N}{1 - \delta\xi} \quad (2)$$

$$\pi_m^N = (p_m^N - c_m^N)q_m^N + w_m^N q_r^N - f \quad (3)$$

$$\pi_r^N = (p_r^N - w_m^N - c_r^N)q_r^N + f \quad (4)$$

Second, in the MSM scenario where the manufacturer invests in the service and serves the online channel, the training cost of the sales staff, commission cost, etc., we set this cost as  $\frac{\theta(e_m^{MSM})^2}{2}$  ( $\theta > 1$ ). When  $U_m^{MSM} > \max\{U_r^{MSM}, 0\}$ , consumers choose online channels to purchase, and the demand function is  $q_m^{MSM}$ , profit is  $\pi_m^{MSM}$ , when  $U_r^{MSM} > \max\{U_m^{MSM}, 0\}$ , consumers choose offline channels to purchase, and the demand function is  $q_r^{MSM}$ , profit is  $\pi_r^{MSM}$ :

$$q_m^{MSM} = \frac{p_r^{MSM} - p_m^{MSM} + ke_m^{MSM}}{1 - \delta\xi} - \frac{p_m^{MSM} - ke_m^{MSM}}{\delta\xi} \quad (5)$$

$$q_r^{MSM} = 1 - \frac{p_r^{MSM} - p_m^{MSM} + ke_m^{MSM}}{1 - \delta\xi} \quad (6)$$

$$\pi_m^{MSM} = (p_m^{MSM} - c_m^{MSM})q_m^{MSM} + w_m^{MSM} q_r^{MSM} - \frac{\theta(e_m^{MSM})^2}{2} - f \quad (7)$$

$$\pi_r^{MSM} = (p_r^{MSM} - w_m^{MSM} - c_r^{MSM})q_r^{MSM} + f \quad (8)$$

Third, in the RSR scenario where retailers invest in offline services and service offline channels, the training cost and commission cost of sales personnel are set as  $\frac{(e_r^{RSR})^2}{2}$ . When  $U_m^{RSR} > \max\{U_r^{RSR}, 0\}$ , consumers choose online channels to purchase, and the demand function is  $q_m^{RSR}$ , profit is  $\pi_m^{RSR}$ , when  $U_r^{RSR} > \max\{U_m^{RSR}, 0\}$ , consumers choose offline channels to purchase, and the demand function is  $q_r^{RSR}$ , profit is  $\pi_r^{RSR}$ :

$$q_m^{RSR} = \frac{p_r^{RSR} - p_m^{RSR} - ke_r^{RSR}}{1 - \delta\xi} - \frac{p_m^{RSR}}{\delta\xi} \quad (9)$$

$$q_r^{RSR} = 1 - \frac{p_r^{RSR} - p_m^{RSR} - ke_r^{RSR}}{1 - \delta\xi} \quad (10)$$

$$\pi_m^{RSR} = (p_m^{RSR} - c_m^{RSR})q_m^{RSR} + w_m^{RSR} q_r^{RSR} - f \quad (11)$$

$$\pi_r^{RSR} = (p_r^{RSR} - w_m^{RSR} - c_r^{RSR})q_r^{RSR} - \frac{(e_r^{RSR})^2}{2} + f \quad (12)$$

Fourth, in the RSM scenario where retailers invest in

offline services and serve online channels, when  $U_m^{RSM} > \max\{U_r^{RSM}, 0\}$ , consumers choose online channels to purchase, and the demand function is  $q_m^{RSM}$ , profit is  $\pi_m^{RSM}$ , when  $U_r^{RSM} > \max\{U_m^{RSM}, 0\}$ , consumers choose offline channels to purchase, and the demand function is  $q_r^{RSM}$ , profit is  $\pi_r^{RSM}$ :

$$q_m^{RSM} = \frac{p_r^{RSM} - p_m^{RSM} + ke_r^{RSM}}{1 - \delta\xi} - \frac{p_m^{RSM} - ke_r^{RSM}}{\delta\xi} \quad (13)$$

$$q_r^{RSM} = 1 - \frac{p_r^{RSM} - p_m^{RSM} + ke_r^{RSM}}{1 - \delta\xi} \quad (14)$$

$$\pi_m^{RSM} = (p_m^{RSM} - c_m^{RSM})q_m^{RSM} + w_m^{RSM} q_r^{RSM} - f \quad (15)$$

$$\pi_r^{RSM} = (p_r^{RSM} - w_m^{RSM} - c_r^{RSM})q_r^{RSM} - \frac{(e_r^{RSM})^2}{2} + f \quad (16)$$

### 3.4. The Sequence of Events.

The sequence of events is shown in Figure 2. First, the online manufacturer chooses whether to provide the service, and second, the manufacturer decides the price of the product, the wholesale price. Then, if the manufacturer chooses to provide the service, the manufacturer also needs to decide on the level of service, and the retailer only needs to decide on the retail price. If the manufacturer chooses not to provide the service and the service is provided by the retailer, then the retailer needs to determine the level of service and the retail price. Finally, the consumer makes the purchase decision, which together realizes the subsequent demand and profit.

## 4. Equilibrium

### 4.1. No-service Benchmark Model

**Lemma 1.** The optimal decisions under no-service (model N) strategy are shown as follows:

**Table 1.** The optimal decisions under no-service (model N) strategy

	model N
$p_m^N$	$\frac{c + \delta\xi}{2}$
$p_r^N$	$\frac{3 - \delta\xi + c}{4}$
$w^N$	$\frac{1 - c}{2}$
$q_m^N$	$-\frac{2c - \delta\xi}{4\delta\xi}$
$q_r^N$	$\frac{1}{4}$
$\pi_m^N$	$\frac{2c^2 - 4c\delta\xi + \delta^2\xi^2 + \delta\xi}{8\delta\xi}$
$\pi_r^N$	$\frac{1 - \delta\xi}{16}$

### 4.2. Service Provided by Manufacturer.

**Lemma 2.** The optimal decisions under manufacturer-service (model MSM) strategy is shown as follows:

**Table 2.** The optimal decisions under manufacturer- service (model MSM) strategy

	model MSM
$p_m^{MSM}$	$\frac{3ck^2\delta\xi - 4ck^2 - 4c\delta^2\xi^2\theta - k^2\delta\xi - 4\theta\delta^3\xi^3 + 4c\delta\xi\theta + 4\theta\delta^2\xi^2}{2(k^2\delta\xi - 2k^2 - 4\theta\delta^2\xi^2 + 4\theta\delta\xi)}$
$p_r^{MSM}$	$-\frac{ck^2 + 4c\theta\delta^2\xi^2 - 2k^2\delta\xi - 2\theta\delta^3\xi^3 - 4c\theta\delta\xi + 3k^3 + 8\theta\delta^2\xi^2 - 6\theta\delta\xi}{2(k^2\delta\xi - 2k^2 - 4\theta\delta^2\xi^2 + 4\theta\delta\xi)}$
$w^{MSM}$	$\frac{1-c}{2}$
$q_m^{MSM}$	$\frac{(\delta\xi - 1)(2c - \delta\xi)\theta}{k^2\delta\xi - 2k^2 - 4\theta\delta^2\xi^2 + 4\theta\delta\xi}$
$q_r^{MSM}$	$\frac{ck^2 - k^2 - 2\theta\delta^2\xi^2 + 2\theta\delta\xi}{2(k^2\delta\xi - 2k^2 - 4\theta\delta^2\xi^2 + 4\theta\delta\xi)}$
$e_m^{MSM}$	$\frac{k(2c\delta\xi - \delta^2\xi^2 - 2c + \delta\xi)}{k^2\delta\xi - 2k^2 - 4\theta\delta^2\xi^2 + 4\theta\delta\xi}$
$\pi_m^{MSM}$	$-\frac{c^2k^2 + 4\theta\delta\xi c^2 - 2ck^2 - 8c\theta\delta^2\xi^2 + 2\theta\delta^3\xi^3 - 4c^2\theta + 8c\delta\xi\theta + k^2 - 2\theta\delta\xi}{4(k^2\delta\xi - 2k^2 - 4\theta\delta^2\xi^2 + 4\theta\delta\xi)} - f$
$\pi_r^{MSM}$	$-\frac{(\delta\xi - 1)(ck^2 - k^2 - 2\theta\delta^2\xi^2 + 2\theta\delta\xi)^2}{4(k^2\delta\xi - 2k^2 - 4\theta\delta^2\xi^2 + 4\theta\delta\xi)^2} + f$

### 4.3. Service Provided by Retailer.

#### 4.3.1 Self-interest Service

**Lemma 3.** The optimal decisions under retailer-service of self-interest strategy are shown as follows:

**Table 3.** The optimal decisions under retailer-service of self-interest strategy

	model RSR
$p_m^{RSR}$	$\frac{\delta\xi + c}{2}$
$p_r^{RSR}$	$\frac{ck^2 + 2c\delta\xi + k^2 - \delta^2\xi^2 - 2c + 4\delta\xi - 3}{2(k^2 + 2\delta\xi - 2)}$
$w^{RSR}$	$\frac{1-c}{2}$
$q_m^{RSR}$	$-\frac{ck^2 + 2c\delta\xi + k^2\delta\xi - \delta^2\xi^2 - 2c + \delta\xi}{2\delta\xi(k^2 + 2\delta\xi - 2)}$
$q_r^{RSR}$	$\frac{\delta\xi - 1}{2(k^2 + 2\delta\xi - 2)}$
$e_r^{RSR}$	$\frac{k(\delta\xi - 1)}{2(k^2 + 2\delta\xi - 2)}$
$\pi_m^{RSR}$	$\frac{c^2k^2 - 2xk^2c + k^2\delta^2\xi^2 + 2c^2x - 4cx^2 + \delta^3\xi^3 -}{4\delta\xi(k^2 + 2\delta\xi - 2)} - f$
$\pi_r^{RSR}$	$-\frac{(\delta\xi - 1)^2}{8(k^2 + 2\delta\xi - 2)} + f$

$$A1 = c^2k^2 - 2\delta\xi k^2c - 4fk^2\delta\xi - 8f\theta\delta^2\xi^2 + k^2\delta^2\xi^2 + 2c^2\theta\delta\xi - 4\theta c\delta^2\xi^2 + \theta\delta^3\xi^3 - 2c^2\theta + 4c\delta\xi\theta + 8f\delta\xi\theta - \theta\delta\xi$$

#### 4.3.2 Spillover Service

**Lemma 4.** The optimal decisions under retailer-service of spillover strategy are shown as follows:

**Table 4.** The optimal decisions under retailer-service of spillover strategy

	model RSM
$p_m^{RSM}$	$\frac{ck^4 + 2ck^2 + k^2\delta^2\xi^2 + 4c\delta^2\xi^2 + k^2\xi\delta + 4\xi^3\delta^3 -}{k^4 + 4k^2\xi\delta + 8\delta^2\xi^2 - 8\delta\xi}$
$p_r^{RSM}$	$\frac{A2}{k^4 + 4k^2\xi\delta + 8\delta^2\xi^2 - 8\delta\xi}$
$w^{RSM}$	$-\frac{A3}{k^4 + 4k^2\xi\delta + 8\delta^2\xi^2 - 8\delta\xi}$
$q_m^{RSM}$	$-\frac{(ck^2 + 4c\xi\delta - k^2 - 2\delta^2\xi^2 + 2\xi\delta - 4c)}{k^4 + 4k^2\xi\delta + 8\delta^2\xi^2 - 8\xi\delta}$
$q_r^{RSM}$	$-\frac{(ck^2 - k^2\xi\delta - 2\delta^2\xi^2 + 2\xi\delta)}{k^4 + 4k^2\xi\delta + 8\delta^2\xi^2 - 8\xi\delta}$
$e_r^{RSM}$	$\frac{(ck^2 - k^2\xi\delta - 2\delta^2\xi^2 + 2\xi\delta)k}{k^4 + 4k^2\xi\delta + 8\delta^2\xi^2 - 8\xi\delta}$
$\pi_m^{RSM}$	$\frac{A4}{k^4 + 4k^2\xi\delta + 8\delta^2\xi^2 - 8\xi\delta}$
$\pi_r^{RSM}$	$-\frac{A5}{2(k^4 + 4k^2\xi\delta + 8\delta^2\xi^2 - 8\xi\delta)^2}$

$$A2 = ck^2\xi\delta + k^4 + ck^2 + 4c\delta^2\xi^2 + 2k^2\xi\delta - 2\xi^3\delta^3 - 4\xi\delta c + 8\delta^2\xi^2 - 6\xi\delta$$

$$\begin{aligned}
A3 &= ck^4 + 4ck^2\xi\delta - k^4 - k^2\delta^2\xi^2 - 2ck^2 + 4c\delta^2\xi^2 \\
&\quad - k^2\xi\delta - 4\xi\delta c - 4\delta^2\xi^2 + 4\xi\delta \\
A4 &= c^2k^2 - ck^2\xi\delta + 2c^2\xi\delta - ck^2 - 4c\delta^2\xi^2 - f \\
&\quad - 4fk^2\xi\delta - 8f\delta^2\xi^2 + k^2\xi\delta + \xi^3\delta^3 \\
&\quad - 2c^2 + 4\xi\delta c + 8f\xi\delta - \xi\delta \\
A5 &= -2f(k^4 + 4k^2\xi\delta + 8\delta^2\xi^2 - 8\xi\delta)^2 \\
&\quad + (k^2 + 2\xi\delta \\
&\quad - 2)(ck^2 - k^2\xi\delta - 2\delta^2\xi^2 + 2\xi\delta)^2
\end{aligned}$$

## 5. Comparative Analysis

### 5.1. Analysis of the Impact of Services on Supply Chain Participants

#### 5.1.1 Manufacturer Services (Model N and Model MSM)

**Proposition 1. analysis of the impact of service on price**

- (1)  $P_m^{MSM} > P_m^N, P_r^{MSM} < P_r^N$
- (2)  $w^N = w^{MSM}$

Proposition 1 presents the impact of MSM strategies on pricing decisions of manufacturers and retailers. The MSM strategy will not have an impact on the manufacturer's wholesale price decision but will affect the retail price decision of online and offline channels. Specifically, the manufacturer adopts the price raising strategy under the MSM strategy. This is because the experience service provided by the manufacturer under this strategy has a value-added effect on the online channel demand, so the manufacturer raises the retail price to obtain greater marginal profit. For retailers, considering the reduction effect of MSM strategy on their offline channel demand, retailers must adopt a price reduction strategy to highlight the price advantage, and then compete with manufacturers for market share.

The above analysis shows the strategic role of offline experience services in pricing decisions of supply chain members. Under the MSM strategy, manufacturers and retailers will adopt different pricing strategies according to the differentiated effect of services on channel demand to ensure that their own interests are maximized.

**Proposition 2. analysis of the service's impact on demand**

- (1)  $q_m^{MSM} > q_m^N, q_r^{MSM} < q_r^N, Q^{MSM} > Q^N$

Proposition 2 presents the impact of MSM strategy on channel demand. In combination with proposition 1, manufacturers will raise prices under the MSM strategy, while retailers will lower prices under the MSM strategy. The reduction of price differences between channels will have a negative effect on online channel demand. On the other hand, under the MSM strategy, offline services provided by manufacturers will bring better product experience to online consumers, thereby improving their purchase intention. At this point, the value-added effect of the service offsets the reduction effect caused by the price difference, which in turn increases online sales. For offline retailers, although the price difference under the MSM strategy is conducive to the increase of offline demand, the service provided by the manufacturer for the online channel has a reduction effect on the offline channel. In this case, the reduction effect is greater than the value-added effect, which leads to the decrease of the offline demand of retailers. Further, the increase in demand for online channels makes up for the decrease in offline

channels, ultimately increasing the total market demand.

The above analysis shows that price cutting is not the only way to gain competitive advantage. Enterprises should also be concerned about the strategic value of services to market demand. Compared with the traditional price war, the supply chain members can improve the shopping experience at the demand side through service input, to achieve the purpose of increasing unit marginal profit and expanding market demand. Blindly lowering prices does not necessarily play a positive role but is not conducive to the sustainable development of enterprises.

#### 5.1.2 Retailer Offering Services (Model N RSM and RSR)

**Proposition 3. analysis of the impact of services on prices**

- (1)  $w^{RSR} < w^{RSM}, p_m^{RSM} < p_m^N = p_m^{RSR}, p_r^N < p_r^{RSM} < p_r^{RSR}, w^N =$
- (2)  $e_r^{RSM} < e_r^{RSR}$

Proposition 3 presents the effects of RSR and RSM strategies on pricing decisions of manufacturers and retailers. When the unit cost of sales meets certain conditions, RSR strategy will not affect the manufacturer's online price and wholesale price but will prompt retailers to raise retail prices. Under the RSM strategy, manufacturers would lower retail prices and raise wholesale prices, and retailers would raise retail prices.

Under the RSR strategy, the manufacturer's retail and wholesale prices do not change. The experience service provided by RSR strategy for offline consumers improves their shopping experience and payment intention, thus promoting the demand for offline channels. At this point, retailers raise prices. Under the RSM strategy, retailers provide experience services for manufacturers' online channel products. To further highlight the competitive advantage, manufacturers on the one hand by reducing channel prices to compete for market share. On the other hand, manufacturers are trying to squeeze retailers' profit margins by raising wholesale prices. And retailers must raise prices to ensure profit margins.

Further, compared with the RSR strategy, both manufacturers and retailers will lower their retail prices under the RSM strategy, but manufacturers will raise their wholesale prices, which may lead to a price war between the two sides. Forced by the price competition of manufacturers, the service effort level provided by retailers under the RSM strategy will be lower than that under the RSR strategy.

**Proposition 4. analysis of the service's impact on demand**

- (1)  $\delta\xi < \frac{2-k^2}{3}$ , if  $0 < c < \min\left(\frac{\delta\xi(k^4+5k^2\delta\xi-3k^2+8\delta^2\xi^2-12\delta\xi+4)}{k^4+4k^2\delta\xi-2k^2+4\delta^2\xi^2-4\delta\xi}, 1\right)$ , then  $q_m^{RSR} < q_m^{RSM} < q_m^N$
- (2)  $\delta\xi < \frac{2-k^2}{3}$ , if  $\max\left(\frac{\delta\xi(k^4+5k^2\delta\xi-3k^2+8\delta^2\xi^2-12\delta\xi+4)}{k^4+4k^2\delta\xi-2k^2+4\delta^2\xi^2-4\delta\xi}, 0\right) < c < \frac{k^2+2\delta^2\xi^2-2\delta\xi}{k^2+4\delta\xi-4}$ , then  $q_m^{RSM} < q_m^{RSR} < q_m^N$
- (3)  $\delta\xi > \frac{2-k^2}{3}, c < \frac{\delta\xi(k^2+\delta\xi-1)}{k^2+2\delta\xi-2}$ , then  $q_m^{RSR} < q_m^{RSM} < q_m^N$
- (4)  $q_r^N < q_r^{RSM} < q_r^{RSR}$
- (5)  $Q^{RSM} < Q^N = Q^{RSR}$

Proposition 4 presents the impact of RSR strategy and RSM strategy on channel demand. Compared with the basic model, the change of strategy will reduce the online demand and increase the offline demand, and the RSM strategy will reduce the total supply chain demand. The positive price difference does not offset the negative effect of service and risk on the online channel, so the sales volume of the online

channel decreases, while the retailers' sales increase because the positive impact of service is greater than the negative impact of price increase.

Specifically, with the increase of unit sales cost, when the comprehensive acceptance degree of online purchase is less than a certain value, compared with the RSR strategy, the online sales under the RSM strategy will further decrease. As the unit cost of sales increases, retailers' risk perception of online service model becomes greater, service effort may be reduced, and sales focus may be partially shifted to offline channels. Therefore, the positive effect of services under the RSM strategy on online channels will be weakened, and online sales will decrease. When the comprehensive acceptance degree of online purchase is greater than a certain value and the unit sales cost is less than a certain value, compared with the RSR strategy, the online and offline sales under the RSM strategy will increase. This is because as the comprehensive acceptance of online purchases increases, the willingness to pay for products purchased through online channels increases, so online sales increase. At the same time, retailers' offline sales also increase due to price differences.

The above analysis shows that from the perspective of service products, whether retailers choose cross-channel services will change the pricing decisions of both sides of the supply chain to varying degrees, thus affecting demand.

## 6. Conclusion

In view of the incentive phenomenon of dual-channel channel competition, based on the differentiation of channel products, this paper studies the purchasing behavior of experiential consumers after they go to the offline exhibition hall to experience the products, and establishes the model MSM of manufacturers providing services for online products that can alleviate channel competition. RSR model for retailers to provide services for offline products; RSM, a model for retailers to service online products. Through comparative analysis of relevant variables, the following conclusions are drawn:

First, for manufacturers, active investment in providing services for online products is the best choice, especially when the differences between online and offline products are large and the interoperability is weak, it is more necessary to invest in services to increase the added value of products and services for online products. Online manufacturers may have more advantages in providing services for online products than offline retailers. When product differences are small and interchangeability is strong, and as fixed payments from payment retailers rise, it is better for manufacturers to have no service, and emulating the service experience at the expense of other additional payments is not a smart choice.

Secondly, for retailers, when product differences are large, it is a better choice for manufacturers to invest in online products and services, and when product differences become smaller, it is a better choice for retailers to invest in online products and services, because retailers, as supply chain terminals, have direct contact with consumers, have a better understanding of consumer consumption habits, and are more familiar with offline service models. You can get higher profit with better service and lower cost.

Finally, when the product difference is large, let the manufacturer bear the service investment online product is the

best for the dual-channel supply chain members, and the overall can get higher profit income. When product differences become smaller, although the supply chain selection strategy remains unchanged, it is the best choice for retailers to invest in online products and services by themselves. Therefore, in summary, channel product differentiation can alleviate channel competition and optimize the dual-channel supply chain, thus improving the overall performance of the supply chain.

However, to facilitate the analysis, this paper combines the two factors of consumers' online purchase uncertainty and product differences and makes the same variable assumption for the unit sales cost of manufacturers and retailers. If these assumptions are relaxed, the next research direction may be to further optimize the model and study offline service spillover, considering inventory, etc.

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