Research on new retail service model with the goal of reducing return rate

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Abstract

Based on the dual-channel supply chain model that considers the impact of new retail services and the existence of return rate, this paper uses the two-stage optimization method to discuss the decision-making of centralized and retailer-led decentralized dual-channel supply chain. The study found that the return rate will increase the retailer's price and service level, and the new retail service can effectively reduce the return rate to bring loss of profits. Under decentralized decision-making, there is a threshold for the return rate. When the return rate falls below the threshold, the return rate can increase the retailer's profit. When the return rate is higher than the threshold, the return rate reduces the retailer's profit. At all, the total supply chain profit under centralized decision-making is greater than the total supply chain profit under decentralized decision-making.

Keywords

Dual channel, new retail service, return rate.

1. Introduction

The rise of ecommerce platforms such as taobao and jingdong , and big data, cloud computing, smart logistics and other technologies development have changed the way people use in shopping[1]. But the network shopping brings convenience to us and also brings high return rate. The national retail federation points out that the value of goods returned from U.S. retail sales is about $286 billion, accounting for 8.89[2] percent of total U.S. sales. In order to reverse this situation, the garment industry, decoration industry and other traditional retailers are new retail transformation, the online and offline combined two kinds of single channel sales model, improve offline new retail services, improve customer experience, reduce the rate of return. The new retail service refers to the multi-channel to upgrade shopping environment, meet customer needs, improve customer experience, and improve operation efficiency and reduce return rate. Dyson vacuum cleaner, for example, in view of the consumer online shopping, established offline services team, directly in the customer home provides the teaching demonstration of suction carpet, curtain, the combination of online and offline network channels return rate from 30% to 10%. From the perspective of consumers, new retail services can improve customers' shopping experience and reduce the return rate by providing personalized and diversified services to consumers. Men's branded Mark Fairwhale offers new retail services under the line, to enhance the delivery of all channels, the effectiveness of goods shipped can be increased to 5 hours[4]. UNIQLO in the double eleven during the "online orders, offline delivery" service, making UNIQLO double eleven store outlets together to create a history of sales success, by the customer hot online and offline pursuit[5]. Under the new retail service model, tmall's return rate after the 2017 Double Carnival was only 6.1%, showing that the new retail service has a significant impact on reducing the return rate and improving customer satisfaction[6].

2. Literature review

At present, many scholars focus on the dual-channel decision-making with service impact, including the impact of service delivery, service type, service overflow and hitchhiking effects on the decision-making of dual channels. Kurata and Nam consider the product after-sales service situation, the

establishment of Nash and Stackelberg model analysis concluded that pareto optimal supply chain service levels below the level of service to meet customer utility[7]. Zhang Xumei and others think that under the influence of pre-sales service, relative to the decentralized decision-making, centralized decision-making under the optimal service level and the lowest price, the final proposed a supply chain—pareto to improve service cost covenant[8]. Zhou Yiting and others research direct marketing channels of personalized service to improve consumer preferences, supply chain profits rise, that the signing of two pricing contracts can achieve supply chain coordination. However, in the dual-channel supply chain, it is easy to generate the service free-riding phenomenon, and consumers enjoy the service in the retail channels to buy the products at low prices on the network, which reduces the enthusiasm of the retailers to provide services[9]. Therefore some scholars study service free riding and supply chain competition decision. Ai xingzheng et al. proposed three pricing strategies to coordinate the impact of service free riding on the supply chain[10]. Based on the theory of consumer utility, Luo Meiling believes that the free riding of online direct sales channels has restrained the enthusiasm of the retailers, but it can coordinate the supply chain through the service cost sharing strategy[11].

The above research focuses on service and supply chain coordination competition, but does not consider the effect of the dual role of service and return rate on retailers and manufacturers. In Chen and Grewal's model of supply chain considering customer returns, the authors assume horizontal and vertical competition between manufacturers and retailers, with one retailer at both retailers providing a full refund in the market, and new retailers entering the market under another Retailer's decision to choose to provide a full refund policy or partial refund policy[8]. McWilliams set up a dual-monopoly model for retailers with quality differences, arguing that a full refund policy would benefit low-quality retailers but hurt the profits of high-quality retailers. Ofek points out that the level of assistant service of retailers can effectively reduce the return rate, improve the pricing and profit level of retailers, and also increase the pricing of online direct selling channels[12]. Considering the retail service and consumer returns, Liu Yongmei thinks that retail service can help to increase retailers' channel power. However, when the level of retail service is greater than a certain threshold, retail service can reduce the return rate and realize the pareto Optimal[13]. Chen Jingxian and other researchers to establish hotelling competition model, companies choose to invest in shop-assisted services to reduce consumer returns, the results show that product heterogeneity and asymmetric return rate of customers will have a significant impact on business decision-making and performance[14].

In real life, many large retailers have both online and offline channels, with retailers having the dominant bargaining power in the supply chain. For example: with more traditional retail stores UNIQLO or Suning, Jingdong and other large e-commerce businesses. These companies have strong bargaining power in the supply chain. Guided by supply chain management theory and game theory, this paper studies the influence of new retail services on the supply chain with return rate in the retailer-led large-scale direct retailers by referring to large direct retailers such as UNIQLO and ZARA.

3. Model

This paper mainly studies retailer-led dual-channel supply chain model. Manufacturers sell products to retailers at wholesale price w. Retailers have both online and offline marketing channels and sell at price p, and $p>w$. Retailers reduce the return on online channels by providing store-assist services through physical stores r. In the model, a represents the total market demand at a price of 0, θ represents the market share of retailers' online channels, b represents the elasticity of market demand to price, λ represents the level of new retail services, r is the product's Return rate, $0<r<1$. Without considering the free-riding behavior of consumers, η represents the sensitivity of the retail channel market demand to service, and $0<k<1$ for improving the match of online channel products for a unit of new retail service. Use Q_e and Q_r to represent the demand of online channels and offline retail channels.

To facilitate analysis, we can make the following assumptions:

1. Supposing manufacturers and vendors are both rational and risk-neutral. Manufacturers generate a single product, in order to reduce the channel conflict caused by the channel price differences, retailers take online and offline the same price decision

2. Retailers provide new retail services λ only in traditional physical channels. The new retail services here include: Reducing consumer uncertainty about product awareness and reducing the likelihood of customer returns through instant customer support, on-site lectures, in-store advertising and promotions, on-site experience and other services. , Play a role in reducing product returns. The cost of store-ancillary services for offline retail channels is C_s=1/2 hλ^2 for Ofek and Miklos.

3. In order to simplify the model, assume that the return of non-quality product problems, customer returns led to the retailer resulting return costs, with R that this article did not consider the product cost of production and channel sales costs. Combined with the actual situation of life, the return rate of traditional offline retail enterprises is very low, this article ignores, this article assumes that the return rate exists only online.

3.1 Demand and profit function.

$$c_2 = a_2 + b_2. \tag{1}$$

Assuming that the demand function is linear, the demand is affected by the channel price and service level. Referring to the linear relationship between channel price and service level, Shi Tao's sales volume of network channels and physical channels of retailers is

$$\mathrm{Q_e} = \theta a - bp \tag{1}$$

$$\mathrm{Q_r} = (1-\theta)a - bp + \eta\lambda \tag{2}$$

Manufacturer sales volume:

$$\mathrm{Q_w} = \mathrm{Q_e} + \mathrm{Q_r} \tag{3}$$

Therefore, the profits of retailers and manufacturers are:

$$\pi_s = (p-w)\mathrm{Q_w} - (1-k\lambda)\mathrm{R}r\mathrm{Q_e} - \frac{1}{2}h\lambda^2 \tag{4}$$

$$\pi_w = w\mathrm{Q_w} \tag{5}$$

4. Retailer-led decentralized dual-channel supply chain model

Retailer-led, dual-channel supply chains, retailers' online and traditional retail channels are Nash static game channels, retailer-led Steinberg models between manufacturers and retailers. The retailer sells at a higher price based on the wholesale price of the supplier, so the retail price can be expressed as $p_R = w_R + m_R$, where m_R is the unit profit of the retailer. The retailer first decides the selling price p_R and the store service level λ_R, and the manufacturer decides the w_R price according to the retailer's behavior. Therefore, according to the inverse inductive method, the manufacturer's reaction function:

$$w_R = \frac{a+\eta\lambda-2bm}{4\mathrm{b}} \tag{6}$$

Retailers make decisions based on manufacturers' reactions

$$\begin{cases} \max\limits_{m、\lambda} \pi_r = (p-w)\mathrm{Q}_w - (1-k\lambda)\mathrm{R}r\mathrm{Q_e} - \frac{1}{2}h\lambda^2 \\ s.t.m、\lambda \epsilon arg\max\pi_\mathrm{r} \end{cases} \tag{7}$$

We can get the optimal retailer unit marginal profit m_R^* and store service level λ_R^*

$$\begin{cases} m_R^* = \frac{(4\mathrm{h}+2nk\mathrm{Rr})(a+\mathrm{bR}r)+(n-\mathrm{b}k\mathrm{Rr})[k\mathrm{Rr}(4\theta a-a)+\mathrm{nRr}]}{4b(4\mathrm{h}+2nk\mathrm{Rr})-2(n-\mathrm{b}k\mathrm{Rr})^2} \\ \lambda_R^* = \frac{4\mathrm{b}k\mathrm{Rr}(4\theta a-a)+4b\mathrm{nRr}+2(n-\mathrm{b}k\mathrm{Rr})(a+\mathrm{bR}r)}{4b(4\mathrm{h}+2nk\mathrm{Rr})-2(n-\mathrm{b}k\mathrm{Rr})^2} \end{cases} \tag{8}$$

The manufacturer's best wholesale price is

$$\mathrm{w_R^*} = \frac{(4\mathrm{h}+2\mathrm{nkRr})(\mathrm{a}+\mathrm{bRr})+\mathrm{rR}(\mathrm{n}-\mathrm{bkRr})[\mathrm{k}(\mathrm{a}+\mathrm{bRr})+(\mathrm{n}-\mathrm{bkRr})]-2\mathrm{bRr}(4\mathrm{h}+2\mathrm{nkRr})+\mathrm{n}[\mathrm{kRr}(4\theta\mathrm{a}-\mathrm{a})+\mathrm{nRr}]}{8\mathrm{b}(4\mathrm{h}+2\mathrm{nkRr})-4(\mathrm{n}-\mathrm{bkRr})^2} \tag{9}$$

Nature 1: the market share of online channels is proportional to the marginal profit and service level of the products. The larger the market share of online channels, the higher the marginal profit and service level. And the influence of the market share of online channels on the service level is greater than the impact on the price.

Prove:

The formula (8) is available

$$\frac{\partial m_e^{R*}}{\partial \theta} = \frac{4a(n-\mathrm{b}k\mathrm{Rr})k\mathrm{Rr}}{4b(4\mathrm{h}+2nk\mathrm{Rr})-2(n-\mathrm{b}k\mathrm{Rr})^2} > 0,\ \frac{\partial \lambda_r^{R*}}{\partial \theta} = \frac{16ab k\mathrm{Rr}}{4b(4\mathrm{h}+2nk\mathrm{Rr})-2(n-\mathrm{b}k\mathrm{Rr})^2} > 0,\ \frac{\partial \lambda_r^{R*}}{\partial \theta} > \frac{\partial m_e^{R*}}{\partial \theta},$$

Nature 2: The increase of the return rate will cause the manufacturer's wholesale price w to decrease, the marginal profit of the product to rise and the return rate to increase the sales price. However, new retail services can reduce the rate of return caused by higher prices and wholesale prices.

Prove: In order to facilitate the calculation, we assume the same level of service. We can conclude

$$\frac{\partial p_e^{R*}}{\partial \mathrm{r}} = \frac{(1-\mathrm{k}\lambda)\mathrm{R}}{8} > 0,\ \frac{\partial m_e^{R*}}{\partial \mathrm{r}} = \frac{(1-k\lambda)\mathrm{R}}{4} > 0,\ \frac{\partial w_r^{R*}}{\partial \mathrm{r}} = \frac{-(1-k\lambda)\mathrm{R}r}{8} < 0$$

Nature 3: The return rate allows retailers to reduce the number of online and offline channel sales, but the new retail service can reduce the sales loss due to the return rate. The number of offline channel sales is proportional to the new retail service λ, and the number of online sales channels is inversely proportional to the new retail service

Prove:

$$\frac{\partial Q_e^{R*}}{\partial \mathrm{r}} = \frac{\partial Q_r^{R*}}{\partial \mathrm{r}} = \frac{-(1-k\lambda)\mathrm{bR}}{8} < 0,\ \frac{\partial Q_e^{R*}}{\partial \lambda} = \frac{-3\eta+k\mathrm{bR}r}{8} < 0,\ \frac{\partial Q_r^{R*}}{\partial \lambda} = \frac{5\eta+k\mathrm{bR}r}{8} > 0$$

Because of the network channel return rate, retailers continue to maintain market share, so by improving the quality of service of retail channels to reduce the return rate of customers in the network channel, to enhance word of mouth trust. However, retailers in order to balance the cost of improving service quality, usually by raising the retail price of products to achieve. In the physical channel, retailers' high-quality service increases sales volume and profits rise more than service cost, so the improvement of service quality makes the profit of physical channel increase. In the network channel, because of the improvement of service quality, the profit increase of the network channel is less than the profit reduction caused by the return. Therefore, the improvement of service quality makes the profit of online channel decrease and the higher the service sensitivity coefficient of consumer, the number of network channels Reduce faster.

Nature 4: Retailers' online channel profit is inversely proportional to the return rate, which can cause the retailer's online channel profit to plummet. Retailer offline channel profit and network channel return rate and quality of service are closely related, at this time the return rate threshold r_0, if the return rate $r < \mathrm{r}_0$, retailer entity channel profits, with the rise in the return rate and rise . If the return rate $r > \mathrm{r}_0$, retailers offline channel profits, with the decline in return rates rise.

Prove:

Substitute the formula (2) into the profit function

$$\frac{\partial \pi_e^{R*}}{\partial r} < 0,\ \frac{\partial \pi_r^{R*}}{\partial r} > 0,\ \frac{\partial \pi_r^{R*}}{\partial r^2} = -2[(1-k\lambda)bR]^2 < 0$$

Therefore, the return rate has a threshold value of r_0, which can maximize the profit of offline channels:

Retailer offline channel profit π_r^R

$$= \begin{cases} \text{As the return rate increases.}, & 0 < r < \dfrac{2(\mathrm{A}_r - \mathrm{A}_e + n\lambda)}{(1-k\lambda)\mathrm{bR}} \text{且} 0 < \lambda < \dfrac{2(\mathrm{A}_e - \mathrm{A}_r) + \mathrm{bR}}{2n + k\mathrm{bR}} \text{或} \lambda > \dfrac{2(\mathrm{A}_e - \mathrm{A}_r) + \mathrm{bR}}{2n + k\mathrm{bR}} \\ \text{As the return rate increases, it decreases.}, & \dfrac{2(\mathrm{A}_r - \mathrm{A}_e + n\lambda)}{(1-k\lambda)\mathrm{bR}} < r \text{且} 0 < \lambda < \dfrac{2(\mathrm{A}_e - \mathrm{A}_r) + \mathrm{bR}}{2n + k\mathrm{bR}} \end{cases}$$

5. Centralized decision-making under the retailer - led dual - channel supply chain model

Considering a centralized supply chain, that is, manufacturers and retailers are vertically integrated in a whole, and in order to maximize the target function π_t , we first discuss some of the properties of π_t, and the objective function is as follows:

$$\begin{cases} \max\limits_{p_t、\lambda_t} \pi_t = p_t \mathrm{Q}_w - (1 - k\lambda_t)\mathrm{R}r\mathrm{Q}_\mathrm{e} - \frac{1}{2}h{\lambda_t}^2 \\ s.t.p_t、\ \lambda_t \epsilon arg\max\pi_\mathrm{t} \end{cases} \tag{10}$$

You get the Hessian matrix:

$$\pi_\mathrm{t} = \begin{pmatrix} \frac{\partial \pi_\mathrm{t}}{\partial {p_t}^2} & \frac{\partial \pi_\mathrm{t}}{\partial p_t \partial \lambda_t} \\ \frac{\partial \pi_\mathrm{t}}{\partial \lambda_t \partial p_t} & \frac{\partial \pi_\mathrm{t}}{\partial {\lambda_t}^2} \end{pmatrix} = \begin{pmatrix} -4\mathrm{b} & \eta - \mathrm{krRb} \\ \eta - \mathrm{krRb} & -\mathrm{h} \end{pmatrix}$$

The size of $\frac{\partial \pi_\mathrm{t}}{\partial {p_t}^2} = -4\mathrm{b} < 0$， $\frac{\partial \pi_\mathrm{t}}{\partial {\lambda_t}^2} = -\mathrm{h} < 0$， $\begin{vmatrix} -4\mathrm{b} & \eta - \mathrm{krRb} \\ \eta - \mathrm{krRb} & -\mathrm{h} \end{vmatrix} = 4\mathrm{bh} - (\eta - \mathrm{krRb})^2$ what we know is uncertain.

Nature 5: if and only if $4\mathrm{bh} > (\eta - \mathrm{krRb})^2$, π_t is p_{dr}、λ_{dr} the joint concave function; If and only if $4\mathrm{bh} < \pi_\mathrm{t}^{dr}$, π_t^{dr} is p_{dr} the concave function, π_t^{dr} is λ_{dr} the concave function.

We can calculate the best price and service level:

$$\begin{cases} p_t^* = \frac{h(a+\mathrm{bR}r)+(\eta-\mathrm{krRb})\mathrm{kbR}r\mathrm{A}_e}{4\mathrm{b}h-(\eta-\mathrm{krRb})^2} \\ \lambda_t^* = \frac{(\eta-\mathrm{krRb})(a+\mathrm{bR}r)+4\mathrm{bkR}r\mathrm{A}_e}{4\mathrm{b}h-(\eta-\mathrm{krRb})^2} \end{cases} \tag{11}$$

Nature 6: Concentrated conditions, the optimal sales price and service level as shown. The new retail service level has resulted in higher selling prices. The return rate results in higher sales prices and service levels, but service levels reduce the price hikes due to returns

Prove:Suppose there is no optimal price for the new retail service $\mathrm{p}_0^* = \frac{a+\mathrm{bR}r}{4\mathrm{b}}$

$p_t^* - p_0^* = \frac{(\eta-\mathrm{krRb})^2(a+\mathrm{bR}r)+4b(\eta-\mathrm{krRb})\mathrm{bR}r\mathrm{A}_e}{4b[4\mathrm{b}h-(\eta-\mathrm{krRb})^2]} > 0$， $\frac{\partial p_t^*}{\partial \mathrm{r}} = \frac{\mathrm{R}(1-k\lambda)}{4} > 0$， $\frac{\partial \lambda_t^*}{\partial \mathrm{r}} = \frac{k\mathrm{R}(\theta a - \mathrm{b}p_t^*)}{h} > 0$，

Nature 7: Assuming there is no retailer service, the relationship between the return rate and the total supply chain profit is related to the market share θ. If and only if $\theta\mathrm{a} < \frac{\mathrm{a}+\mathrm{bR}}{4}$, that is, the market share of online channels is very small and less than 1/4 of the total market share, the return rate increases the retailer's total profit. $\theta\mathrm{a} > \frac{\mathrm{a}+\mathrm{bR}}{4}$, the return rate so that retailers reduce the total profit.

Prove:

The total profit of the supply chain without new retail service is$\pi_0^* = \frac{a^2+(\mathrm{bR}r)^2-2a\mathrm{bR}r(4\theta-1)}{8\mathrm{b}}$， The size of total π_t^* is related to θ.

Nature 8: In the presence of new retail services, the retailer's service level increases the overall profitability of the retailer. And the total profit of the supply chain with new retail service has always been greater than the total supply chain profit without service. It can be seen that the new retail service can reduce the return loss profit loss.

Prove:

The difference between total supply chain profit π_t^* with new retail service and total supply chain without retail service is

$$\Delta = \pi_t^* - \pi_0^*$$
$$= \frac{(a+\eta\lambda_t)^2 - a^2 + [(1-k\lambda_t)^2 - 1](bRr)^2 - \left[[(\theta-1)a - \eta\lambda_t](1-k\lambda_t) - (\theta-1)a\right]2bRr - 16\mathrm{hb}\lambda_t^2}{8b}$$

Available $\frac{-k\lambda_t(\theta-1)a-\eta\lambda_t(1-k\lambda_t)}{(1-k\lambda_t)^2-1} > 0$ and when $AK < B^2$, the profit margin increases as the return rate increases, and there are $A = a(2a+\eta\lambda_t) - 4\mathrm{bh}\lambda_t^2$, $K=(1-k\lambda_t)^2-1$, $B== k\lambda_t(\theta-1)a + \eta\lambda_t(1-k\lambda_t)$

6. Contrast the two decision models

Retailers dominate the dual-channel supply chain model, decentralized decision-making and centralized decision-making under the supply chain prices, service levels, profits compared. First, the sales price under centralized decision-making is less than the sales price under decentralized decision-making, but the return rate has a greater impact on the price under centralized decision-making .

Prove:

For the sake of calculation, we assume that the service level is the same:

$$p_R - p_t = \frac{a+\eta\lambda+\mathrm{bR}r(1-k\lambda)}{8\mathrm{b}} > 0, \frac{\partial p_R}{\partial r} = \frac{\mathrm{R}r(1-k\lambda)}{8} < \frac{\partial p_t}{\partial r} = \frac{\mathrm{bR}(1-k\lambda)}{4\mathrm{b}}$$

Centralized supply chain under the condition of supply chain is greater than the decentralized decision making service levels, can calculate $\lambda_t^* - \lambda_R^* > 0$。

7. The numerical simulation

In order to better understand the effect of new retail services on the dual channels of return rate, a numerical demonstration is given. Let's say a=200, b=6, h=5, n=3, k=0.1, R=10. First, the effect of return rate on sales price:

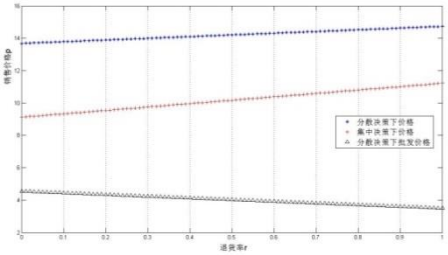

Fig.1 prices and wholesale prices under different decisions

According to fig.1, the sales price p under the decentralized decision is greater than that in the centralized decision, but the return rate has a greater impact on the sales price p under the centralized decision. At the same time, the wholesale price of the decentralized decision decreases with the return rate. In reality, the return rate reduces the number of retailers' sales, as well as reducing the number of manufacturers, so manufacturers have reduced wholesale prices to encourage retailers to continue selling

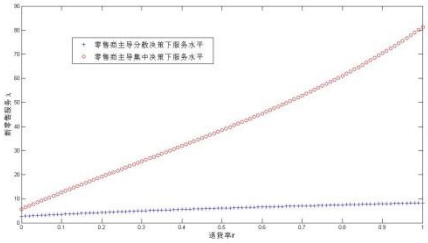

Fig. 2 comparison of service level under different decision making

As can be seen from fig.2, the return rate will increase the service level under the centralized decision-making and decentralized decision-making, but the return rate will affect the service level under the centralized decision-making more than the service level under decentralized decision-making Figure 3 retailer profits under decentralized decision making.

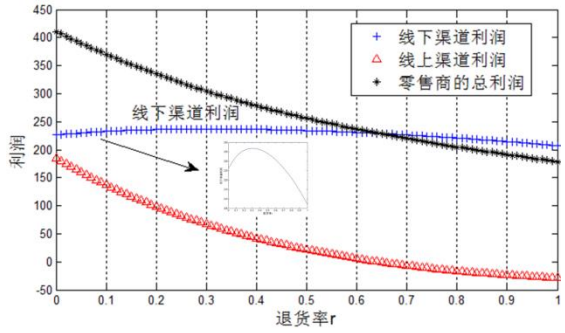

Fig. 3 Retailer profit under decentralized decision making

From fig. 3, with decentralized decision-making, the retailer's total profit decreases as the return rate increases. However, there is a threshold for the retailer's offline channel profit. When the return rate falls below the threshold, the retailer's offline channel profit increases. When the return rate is above a certain threshold, the retailer's offline channel profit decreases. Retailer's online channel profit decreases as the return rate increases Figure 4: poor profit margin between centralized decision making and decentralized decision making.

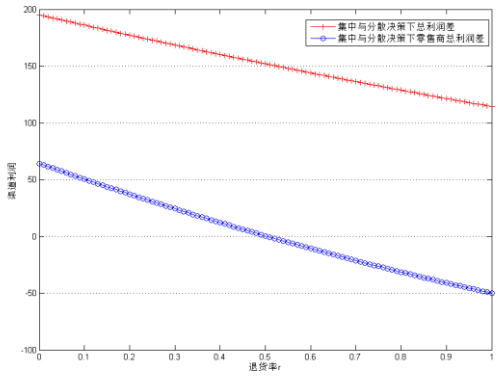

Fig. 4 Poor profit under centralized decision-making and decentralized decision-making

From Fig.4 we can see the total supply chain profit under centralized decision-making is greater than the total supply chain profit under decentralized decision-making, and the total profit of the supply chain is greater than zero. However, as the return rate increases, the profit margin gradually decreases. When the return rate is less than the threshold, the retailer's profit under the centralized decision is larger than the retailer's profit under the decentralized decision. When the return rate is greater than the threshold, the retailer's profit under the centralized decision is smaller than the decentralized decision Retailer profit. Therefore, retailers, according to the return rate of goods to choose the decision-making and pricing, to find the optimal profit retailers.

8. Conclusion

This paper discusses the influence of new retail service and return rate on dual channel supply chain by establishing the optimal pricing model of centralized dual channel supply chain and decentralized dual channel supply chain. Study found that retail prices with the increase of rate of return, but under decentralized decision making product sales price is greater than the product sales price under centralized decision making, but new retail service level under centralized decision level of service greater than under decentralized decision making. Under centralized decision-making, reduce the

return rate caused by rising sales prices or loss of profits, so the selling price under decentralized decision is higher. Exist at the same time, under the decentralized decision making product return ratio threshold, when the return rate is less than the threshold, retailers, offline channels increases with the rising of profits as the rate of return, when the rate of return is greater than the threshold, retailers, offline channel profit decreased with the increase of rate of return. This is also in line with real life, and a certain amount of return can stimulate consumers to buy, increase the retailer's purchase, and increase the retailer's profit. In decentralized decision-making, as the return rate increases and the sales price increases, manufacturers increase their profits by increasing the wholesale price in order to reduce the loss of sales caused by the return rate. As a result, returns and services exacerbate the "double marginal" effect of retailers and manufacturers. Finally, the total supply chain profit under centralized decision making is greater than the total profits under decentralized decision making, but in view of the retailers, under certain conditions, retailers under decentralized decision making profit is greater than the concentration under the condition of retailers' profits. In the actual production operation, the retailer can make the decision according to the return rate of the commodity, and realize the profit optimization of the retailer.

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References

[1] Sun Shouqiang: New Retail New Era New Perspective, Global Market Information Guide, Vol.05 (2017) No.2, p.50-50

[2] Information on https://nrf.com/resources/retail-library/consumer-returnsthe-retail-industry.

[3] Information on http://www.360doc.com/content/16/0310/02/30626156_540924835.shtml.

[4] Information on http://news.sina.com.cn/o/2017-08-23/doc-ifykiqfe0928420.shtml.

[5] Information on http://www.sohu.com/a/119171322_165453.

[6] Information on http://tech.163.com/17/1123/16/D3UKKJP700097U7R.html.

[7] Kurata H, Nam S H: After-sales service competition in a supply chain: Optimization of customer satisfaction level or profit or both? International Journal of Production Economics, vol. 1 (2010) No.3, p.136-146.

[8] Zhou Yiting, Liu Liwen: Decision and Coordination of Dual-Channel Supply Chain Considering Personalized Service, Technology and Economy, Vol. 4 (2015) No.3, p.107-114.

[9] Ai Xingzheng, Ma Jianhua, Chen Zhong, et al.: Coordination mechanism between electronic channels and traditional channels for free-riding, Journal of Systems Engineering, Vol. 43(2011) No.1, p.507-514

[10] Luo Meiling, Li Gang, Sun Linyan: Dual-Channel Supply Chain Competition with Service Spillover Effect, Journal of Systems Management, Vol. 6(2011) No.1, p.648-657

[11] Ofek E, Katona Z, Sarvary M: "Bricks and Clicks": The Impact of Product Returns on the Strategies of Multichannel Retailers, Marketing Science, Vol. 30 (2011) No.1, p.42-60

[12] Liu Yongmei, Liao Pan, Hu Junhua, et al.: Research on pricing of dual-channel supply chain considering service and return, Operations Research and Management, Vol. 24(2015) No.3, p.79-87

[13] Chen Jingxian, Yang Feng, Liang Liang: Equilibrium Analysis of Store Auxiliary Service Strategy to Reduce Customer Returns, System Engineering Theory and Practice, Vol. 36(2016) No.2, p.374-383

[14] Shi Tao, Chen Jiao: Decision-making Research on the Introduction of Online Retail Channels Based on Service Importance, Management Review, Vol. 36(2013) No.1, p.82-89