

# Service Strategies Considering Consumer Preferences under Retailer Sales Efforts

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**Abstract:** While previous literature considers retailer service strategies and consumer service preferences, the impact of retailer sales efforts and consumer service preferences on service strategy decisions in the supply chain has not been considered. Therefore, we consider three decision models under retailer sales effort to explore the impact of consumer service preferences on stakeholder equilibrium decisions in the supply chain. Then, we analyze and explore manufacturer and retailer profits.

**Keywords:** Sales Effort; Service Strategy; Consumer Preference

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## 1. Introduction

Homogenization of the product market is now a common phenomenon. Consumers are also becoming increasingly picky about their products. For example, consumers are not only concerned about the market price when purchasing products, but also about the availability of logistics services, such as return insurance and free return logistics services.<sup>[1]</sup> Consumers' concern about services has also increased competition in the market. Therefore, most companies have committed to offering a wider range of logistics services to acquire a competitive advantage. Companies face the constraint of additional costs for providing logistics services, which is something they need to consider.<sup>[2]</sup> For example, Amazon outsources its logistics operations to large 3PL companies such as USPS, FedEx, and United Parcel. This naturally leads to a practical question: How do firms choose logistics services?

To analyze the choice of logistics services, we investigate the following questions: How do retailers choose logistics services considering retailers' sales efforts and consumers' preferences? How does the logistics service strategy affect the service level under consumer preference? Which logistics service strategy is conducive to increasing stakeholder profits?

We establish a supply chain which includes manufacturers and retailers to solve these problems. We analyze the decision model under three logistics service strategies. Then, we analyze the equilibrium decisions of stakeholders under different logistics service strategies. In addition, we explore consumer surplus (cs) and social welfare (sw) under different service strategies and conduct extensive numerical experiments to validate the results.

## 2. Literature review

We focus on the impact of consumer preferences on service strategy decisions given the retailer's marketing efforts. We explore the literature review related to this paper from three streams. The first stream is the literature relevant to retailers' sales efforts, and the second stream investigates the literature associated with consumer preferences. Finally, we examine the literature on logistics services.

### 2.1 Sales efforts

Our study is related to the widespread retailer sales effort in practice.<sup>[3]</sup> Moreover, some literature has introduced sales effort to the field of production operations and management and game analysis (Mukhopadhyay et al., 2009; Ma et al., 2013; Duan et al., 2021; Du et al., 2022; Heydari et al., 2022). For example, Chernonog et al. (2015) analyzes the equilibrium decisions of risk-sensitive decision makers considering sales effort and investigates the optimal decisions under incomplete information. Similarly, Li et al. (2021) explores the impact of different risk criteria on the production decisions and sales effort of firms with risk-averse characteristics. The results suggest that these criteria may lead to similar results, i.e., deviations from risk-neutral decisions.<sup>[4]</sup> In addition, some literature has explored coordination strategies in supply chains with sales effort (Avinadav, 2020; Li et al., 2021; Wu et al., 2022). Hosseini-Motlagh et al. (2022) uses an evolutionary game approach

to analyze the profit surplus allocation problem in a retailer-invested sales effort supply chain, and they show that manufacturers are more inclined to choose coordination strategies. Saha et al. (2019) tackled the channel coordination problem in sales effort-sensitive supply chain and explored channel coordination strategies in different scenarios and equilibrium decisions.<sup>[5]</sup> Xu et al. (2022) analyzed the effects of free-riding and consumer preferences on sales effort and stakeholder decisions in a capital-constrained two-channel supply chain.

We also consider the impact of sales effort on retailers' and manufacturers' equilibrium decisions. Unlike the above literature, we emphasize analyzing the influence of consumer preferences on the service strategy under the retailer's sales effort, which is not considered in some literature. Moreover, we explore social welfare under different service strategies.

## 2.2 Consumer preferences

Consumer behavior plays a vital role in affecting producers' production decisions, such as consumer preferences. Our study is also related to consumer preferences. In addition, some scholars have considered the influence of consumer preferences on firms' production decisions and service provision (Zhang et al., 2020; Cao and Zhang, 2021; Feng et al., 2022). For example, Zhang et al. (2020) discussed service decisions in a two-channel supply chain network under consumer preferences, and they show that supply chain profits can be improved when consumer preferences large enough. In addition, several other literatures have explored the impact of consumer preferences on sustainability and carbon abatement (Zhang et al., 2019; Wang et al., 2020; Ghosh et al., 2020; Ma et al., 2022). We can observe that the field of consumer preferences has been studied extensively and yielded abundant findings. However, the literature considering consumer preferences on service strategy choice under retailer sales efforts has yet to be expanded, which is the emphasis of our paper. Moreover, we probe the impact of consumer preferences on different service levels and strategies and consumer surplus.

## 3. Analysis

In this section, we investigate the logistics service scenarios in different models and explore the equilibrium outcome for the stakeholders.

### 3.1 Retailers provide services

In Scenario , the manufacturer offers the product to the retailer, and the retailer sell the product to the final consumer and provide the service. Therefore, we deduce the profit function of the stakeholders under scenario as follows.

$$\pi_M^R = (w-c)(a-p + \gamma s_r + \beta e), \pi_R^R = (p-w)(a-p + \gamma s_r + \beta e) - \frac{k(s_r)^2}{2} - \frac{\eta e^2}{2},$$

where the superscript "R" represents scenario R, and the subscripts "R" and "M" indicate the manufacturer and retailer, respectively.

Further, we get the optimal results for scenario R by solving the profit functions of the stakeholders. The main conclusions are summarized in Proposition 1.

Proposition 1. The optimal wholesale price for the manufacturer and the optimal price, service and sales effort decisions for the retailer are as follows:

$$w^{R*} = \frac{a+c}{2}, p^{R*} = \frac{ak(\beta^2-3\eta)+ck(\beta^2-\eta)+a\gamma^2\eta+c\gamma^2\eta}{2(k(\beta^2-2\eta)+\gamma^2\eta)}, s_r^{R*} = \frac{(-a+c)\gamma\eta}{2(k(\beta^2-2\eta)+\gamma^2\eta)}, e^{R*} = \frac{(-a+c)k\beta}{2(k(\beta^2-2\eta)+\gamma^2\eta)}.$$

Further, we have the optimal profit for the stakeholders as follows:

$$\pi_M^{R*} = -\frac{(a-c)^2k\eta}{4(k(\beta^2-2\eta)+\gamma^2\eta)}, \pi_R^{R*} = -\frac{(a-c)^2k\eta}{8(k(\beta^2-2\eta)+\gamma^2\eta)}.$$

According to the optimal outcome for stakeholders in scenario , we investigate consumer surplus and social welfare in scenario (see Proposition 2).

Proposition 2. According to the optimal outcome for the stakeholders, we have

$$CS^{R*} = \frac{(a-c)^2k^2\eta^2}{8(k(\beta^2-2\eta)+\gamma^2\eta)^2}, SW^{R*} = \frac{(a-c)^2k\eta(-3k\beta^2+7k\eta-3\gamma^2\eta)}{8(k(\beta^2-2\eta)+\gamma^2\eta)^2}.$$

### 3.2 Retailers and manufacturers collaborate to provide services

In Scenario C, manufacturers and retailers collaborate to deliver services. This service provide model is also prevalent in practice. In the situation where the retailer and manufacturer collaborate to provide a service, the manufacturer shoulders part of the cost of the service. The retailer sells the product to the final product market (consumers) and determines the service level. Therefore, we deduce the profit func-

tion of the stakeholders in scenario C as follows:

$$\pi_M^C = (w - c)(a - p + \gamma s_r + \beta e) - (1 - \lambda)k(s_r)^2/2,$$

Then, we yield the equilibrium decisions of the stakeholders in scenario C by solving the profit functions of the stakeholders. The main result given in Proposition 3.

Proposition 3. In Scenario C, the optimal decisions related to the manufacturer and the retailer are as follows:

$$w^{C*} = \frac{-a\gamma^2\eta + (2a+c)\gamma^2\eta\lambda + (a+c)k(\beta^2-2\eta)\lambda^2}{2k(\beta^2-2\eta)\lambda^2 + \gamma^2\eta(-1+3\lambda)}, p^{C*} = \frac{c\lambda(\gamma^2\eta + k(\beta^2-\eta)\lambda) + a(k(\beta^2-3\eta)\lambda^2 + \gamma^2\eta(-1+2\lambda))}{2k(\beta^2-2\eta)\lambda^2 + \gamma^2\eta(-1+3\lambda)},$$

## 4. Conclusion

We investigate the equilibrium decisions of manufacturers and retailers in different service strategies under retailer sales efforts. We explore the decision models under three different service strategy scenarios, i.e., consumer-provided services, manufacturer-retailer collaborative service provision, and service outsourcing. We also examine the equilibrium decisions of stakeholders. Then, we discuss the stakeholders' profit and service levels in different scenarios. In addition, we analyze the CS and SW under different service models. Finally, according to the presented model and the analysis outcomes. We have the following conclusions.

First, we demonstrate that retailer profits under scenario R are consistently superior among the three service strategies. In other words, retailers are more profitable under scenario R, i.e., retailer service strategies are more favorable to retailers. Second, comparing manufacturer profits under different scenarios, we find that manufacturer profits under the three scenarios increase with consumer service preferences. Finally, we compare and analyze CS and SW under different scenarios. The findings reveal that CS and SW under scenario C are better than other scenarios when  $\lambda$  is higher than the threshold. Furthermore, we demonstrate that CS and SW under scenario R are more likely to be optimal when  $\lambda$  is low.

There are several interesting research directions worth exploring in the future. First, we have not considered the effect of information sharing on service model choice. Considering service strategies under information asymmetry may bring different results. Second, considering service models under demand uncertainty may be interesting. Finally, considering manufacturer services or platform services may be an interesting direction and worth exploring in the future.

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