Pricing Decisions and Provider Choice on Extended Warranty Service in Supply Chain

Rong Zhang, Shanghai Maritime University, Shanghai, China
Mengjiao Li, Shanghai Maritime University, Shanghai, China
Bin Liu, Shanghai Maritime University, Shanghai, China

ABSTRACT

This article constructed a manufacturer-leading supply chain system considering the extended warranty service (EW) with a single manufacturer and a single retailer to study the influence of service cost on the choice of the EW provider. First, this article analyzed retail pricing, EW pricing, EW quality, the manufacturer’s profit, the retail’s profit and the total system profit in Model M and Model R. Then, the article analyzed the influence of service cost on the choice of the EW provider. Finally, it shows that if only part of consumers purchases the product with the EW, the manufacturer benefits from EW provided by the retailer. However, the retailer has to balance the ratio of the service cost coefficient. Furthermore, all consumers purchase the product with the EW, both the manufacturer and the retailer has to balance the ratio of service cost coefficient between manufacturer and retailer.

KEYWORDS

Extend Warranty Service, Game Theory, Service Cost, Supply Chain Management

INTRODUCTION

In the era of e-commerce and Big Data, the competition in the commodity market has become increasingly intense, consumer’s consumption concept also gradually changes with the improvement of living standards. Consumers nowadays put forward higher requirements for quality and product service. Therefore, many companies started to add value of product through extended warranty service (EW). Maronick (2007) notes that the majority of American consumers purchase extended warranties while purchasing household electrical appliances. According to statistics, nearly one-third of consumers choose to purchase EW in the foreign auto industry, while the proportion in the household appliance industry is up to 75% (Desai & Padmanabhan, 2004). Liao and Li (2016) show that warranty policy can enhance profit. EW is actually a new profit growth point for companies. Thirty percent revenue of Dell comes from EW (Zhang, 2015). Berner (2004) notes that the profits from extended warranties accounted for almost a half of Best Buy’s operating income in 2003. In China, the EW is first provided by Gome in 2006. In 2008, Suning provided “Sunshine Package” as its EW. In 2013, both Jingdong and T-mall launched their own EW. EW helped enterprises compete for market share and improve their competitivenes, while also needs a certain cost. Therefore, how to balance the input and output of EW gradually becomes the focus of attention.

Literature related to supply chain comes from many sources (Kelepouris et al., 2012, Luitel et al., 2014). In recent years, scholars have studied the issue of EW from the perspective of supply chain. Lutz et al. (1998) study the impact of EW on manufacturer warranty policy under manufacturer

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moral hazard. Desai (2004) uses the master-slave game to study the coordination of sales channels for EW when there is a competition between manufacturers. Li et al. (2005) consider a supply chain involving an independent retailer and an independent manufacturer, they developed a game theory model to study two common practices of selling extended warranties. Heese (2012), by considering a supply chain containing two competing manufacturers and a retailer, shows that retailer providing EW had a negative impact on manufacturers’ basic warranty. Li et al. (2012) discuss the length of the EW period and the price of the EW when it is respectively provided by the manufacturer, the retailer or a third party. Su et al. (2012) analyze two EW models from the manufacturer’s perspective by comparing the EW cost with the expected profit. Wang and Hu (2010) investigate how attractive index of extended warranty influences manufacturers’ EW choice. Zhang et al. (2012) construct a service demand function of EW based on customer’s risk aversion, they establish two models: the manufacturer sales EW directly and sales EW through retailer, and explore the impact of the service level on manufacturer profit. Nie et al. (2014) take quality level of product as an endogenous variable to build a basic model without EW as well as models which manufacturers provide EW and retailers provide EW. The result shows that whichever side provides EW, profits are higher than those without. Yi et al. (2016) investigate supply chain coordination under EW in consideration of network externality. The study shows that under the influence of network externality, two-tariff contract can reach a Pareto improvement in supply chain, thus the chain can be coordinated.

In conclusion, the literature has shown that EW will improve the profits no matter who provides it. However, considering service cost, there are still little literatures discuss exactly who provides the EW can be more profitable. The study nowadays is mainly focused on EW is provided by the manufacturer (Model M) or provided by the retailer (Model R). The manufacturer and the retailer will have different service cost of EW with different technology level. Therefore, this paper investigates the EW provider choice when the manufacturer and retailer service cost ratio coefficient changes.

**PROBLEM DESCRIPTION AND ASSUMPTIONS**

We consider a simple two-echelon supply chain containing a single manufacturer and a single retailer. Manufacturer is the leader in supply chain while retailer is the follower. The product is manufactured by the manufacturer and then is sold to the retailer at a wholesale price. The retailer sells the product at a retail price. EW can be provided by either the manufacturer or the retailer, the provider determines the price and the quality of the EW. Consumers can choose to purchase the product only or the combination of product and EW.

Parameters in this paper are shown as follow: \( w \) represents the unit wholesale price given by manufacturer; \( c \) represents the unit product cost; \( p \) represents the unit retail price; \( p_s \) represents the unit EW price; \( q_s \) represents the quality of EW; \( k_i \) represents the service cost coefficient for providing EW, and also represents the cost control level of providing EW, where \( i = m, r : \frac{\pi_i}{j} \) represents the profit of \( i \) in mode \( j \), where the superscript \( i = m, r, SC \), respectively, represents manufacturer, retailer and supply chain, superscript \( j = M, R \), respectively, represents the mode which EW is provided by manufacturer and retailer.

We give the following assumptions:(1) the cost of EW is \( k_i q_s^2 / 2 \); (2) the retailer’s product demand function is \( Q = a - \mu p, a \) is the market size, \( \mu \) is consumer’s sensitivity coefficient to the product price, where \( \mu > 0 \); (3) the demand function of EW is \( Q_s = Q - \beta p_s + \gamma q_s \). The demand of EW is determined by the demand of product \( Q \), the price and the quality of EW \( q_s, \beta \) and \( \gamma \) are the sensitive coefficient of EW price and quality respectively, where \( 0 < \beta < 1, 0 < \gamma < 1 \); (4) The ratio of service cost coefficient between manufacturer and retailer is \( \theta = k_r / k_m \), where \( \theta > 0 \).
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