Coordination Contracts of Dual-Channel Supply Chain Considering Advertising Cooperation

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ABSTRACT

To study the impact of advertising cooperation on the decisions of dual-channel supply chain, a dual-channel supply chain system consisting of a single manufacturer and a single retailer is considered. The manufacturer can sell products to customers either through a direct marketing channel or through a traditional retail channel. This paper analyses the level of advertising investment and supply chain profits of centralized and decentralized dual-channel supply chains based on a Stackelberg game. Then, the decision models of dual-channel supply chain under different contracts are constructed, and how manufacturers can optimize the profits of both sides through an effective coordination mechanism is analyzed. The research results show that the improved advertising costs and revenue sharing contract can perfectly coordinate the dual-channel supply chain system. Numerical experiments illustrate the impacts of parameters on the optimal decision results.

KEYWORDS

1. INTRODUCTION

With the rapid development of e-commerce and logistics information technology, online shopping has gradually gained acceptance among consumers. Hence, as a response to this transformation, enterprises have established online direct sales channels to sell their products in addition to their existing offline channels. According to New York Times, 42% of top suppliers, like Apple and Lenovo sells their products over the internet directly (Zhang and Wang, 2018). The development of online direct sales channels can better meet the needs of consumers with different channel preferences and improve the operation efficiency of enterprises. Chiang et al. (2003) found that the manufacturer can mitigate the profit loss by introducing a direct channel. Kumar and Ruan (2002) pointed out that manufacturers can generate more profits by using a direct channel. They also indicated that this will benefit retailers as well. As a result, online and offline channels coexist, forming a dual-channel supply chain system. However, consumers only choose one of these channels to purchase products, thereby leading to conflicts and competition between the two. To resolve this issue, many coordination contracts have been proposed (Jabarzare and Rasti-Barzoki, 2019; Xie et al., 2017).

Advertising cooperation has been proposed as an effective coordination contract for monetary incentives offered by manufacturers to retailers to boost the advertisement of their products. According to a survey conducted by netsertive in 2015, manufactures incurred an estimated cost of $36 billion, which amounts to approximately 12% of their total advertising spending (Giovanni et al., 2019; Reprot, 2015). This is because the advertising is generally done by retailers to increase market demand and improve supply chain efficiency. However, retailers spend a lot of resources on advertising, thus leaving no incentives for retailers to invest in advertising. As compared to traditional channels, the lack of incentives to advertise is more obvious in dual-channel supply chain.

Giovanni et al. (2019) proposed that coordination of supply chains can be realized by establishing advertising cooperation contract. Aust and Buscher (2014) and Jørgensen and Zaccour (2014) have also verified the effectiveness of advertising cooperation for firms in a supply chain. Therefore, designing various coordination contracts based on advertising cooperation is important for improving the performance of dual-channel supply chain. The importance of coordination contracts in the case of dual-channel supply chain has been widely recognized in the extant literature (Berger et al., 2006; Chen, 2015; Chen et al., 2012; Jabarzare, N. and Rasti-Barzoki, 2019). Most studies have advanced single coordination contracts to coordinate dual-channel supply chains, which often cannot eliminate double marginalization. For example, Xie et al. (2017) investigated coordination contracts of centralized and decentralized dual-channel closed-loop supply chain and found that advertising increases offline demand, but fails to coordinate the supply chain. In the literature on coordination of dual-channel supply chain with respect to advertising cooperation, there is very limited research on combination contracts, which may remove double marginalization.

To fill abovementioned research gap, we consider the effects of advertising and investigate pricing and advertising level decisions of dual-channel supply chain in the cases without a coordination contract and with one coordination contract. Furthermore, by verifying the imperfect coordination of one coordination contract, we incorporate two coordination contracts and succeed in coordinating a dual-channel supply chain. Specifically, we address the following research questions:

1. What are the equilibrium results of a dual-channel supply chain under different models?
2. How to coordinate a dual-channel supply chain?
3. How do various factors such as the proportion of the traditional retail market affect the decisions of dual-channel supply chain?

To answer the above questions, we investigated five models of dual-channel supply chain: (1) centralized scenario (model c), where the manufacturer and retailer make decisions as a whole (this model is the benchmark model); (2) decentralized scenario (model d), where the manufacturer and retailer make decisions to maximize their profits individually by playing a manufacturer-dominant Stackelberg game; (3) cooperative game with advertising cost-sharing contract (model a), where the manufacturer shares the advertising cost with the retailer; (4) cooperative game with revenue-sharing contract (model r), where the retailer shares its revenue with the manufacturer; (5) cooperative game with an improved contract (model i), where the manufacturer shares both the advertising cost and the revenue with the retailer.

Our main findings are as followed: First, the retail price of the online channel under the decentralized scenario is the lowest, while the retail price of the offline channel and advertising level under the decentralized scenario is the highest. Second, the improved advertising cost and revenue-sharing contract can perfectly coordinate the dual-channel supply chain system. Third, the higher the proportion of traditional retail market, the higher the advertising level, but it is not always beneficial for supply chain efficiency.

The remainder of this paper is structured as follows. Section 2 discusses the relevant literature. In Section 3, we describe the dual-channel supply chain coordination problem and present the model hypothesis. In Section 4, non-cooperative decision model of a dual-channel supply chain is analyzed.

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