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Manufacturer's cooperative advertising, demand uncertainty, and information sharing

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ABSTRACT

We assume a manufacturer–retailer supply chain where the manufacturer opens an online channel and provides a monetary support to the retailer to implement a local advertising campaign. Both the manufacturer and the retailer have their own information about the state of market demand. We thus examine the value of manufacturer's cooperative advertising and its strategic influence on information sharing of the manufacturer and the retailer. Our results show that the manufacturer's cooperative advertising coordinates the dual-channel distributions effectively and helps improve the channel performance under the environment of demand uncertainty. However, the manufacturer's cooperative advertising also stimulates the retailer to distort its information while the manufacturer has a motivation to understate its forecast. Hence, an advertising agency should be employed to verify the shared information and help make an optimal investment in advertising, so that information distortion can be eliminated and optimum results can be achieved.

1. Introduction

Nowadays e-commerce is becoming more and more popular in the business market, many manufacturers, such as Lenovo, Dell Computer, Sony, Clarks, Nike, Cisco System, and P&G, are using online channel to sell their products directly to consumers, which leads to channel competition and conflict between the online and traditional channels. In order to alleviate the channel competition and conflict, the manufacturer often offers a monetary support to its retailer to implement a local advertising campaign (i.e., the manufacturer's cooperative advertising). In the business market, Apple, Dell, and HP are actively utilizing this strategy to help their retailers implement a local advertising campaign (Pei, Toombs, & Yan, 2014). As more channels sell the same manufactured products, market competition becomes more intense, which makes demand information become a critical resource to firms.

As an efficient tool in improving information precision, information sharing between supply chain players is becoming increasingly prevalent (Gal-Or, Geylani, & Dukes, 2008). Manufacturers often have wide ranging information about the entire market and the products, while retailers have point-of-sale data, deep knowledge about regional consumer purchases, etc. Hence, when information sharing arrangements have been implemented, different signals can be pooled, yielding more accurate forecast information about market demand (Gal-Or et al., 2008). In the business market, Wal-Mart and Warner-Lambert, maker of Listerine brand mouthwash, agreed to share their demand information six months in advance of the expected retail sale date to improve order accuracy (Seifert, 2003). Apparel manufacturer VF and its retailer ShopK have benefited from exchanging information during product distribution. Considering these successful examples, it seems intuitive that information sharing has a uniform effect on firm performance and always can benefit the parties involved in such an arrangement. However, this result is not obvious and the strategy needs careful study.

In this paper, we develop a conceptual framework to investigate how the manufacturer's cooperative advertising coordinates the dual-channel distributions under the environment of demand uncertainty and influences the information sharing of supply chain players. We first present a profit maximization model to obtain optimal strategies under different settings for each firm: (1) the non-information sharing setting and (2) the information sharing setting. We then compare these strategies and derive the important results. Finally, we address the issue of information distortion while sharing information, and propose an effective mechanism to eliminate any possible information distortion and thus an optimum result can be achieved.

The rest of our paper is organized as follows. In the next section, we provide a summary of the relevant literature. Then we present our model framework and analysis. Finally, conclusions and managerial implications are presented.

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2. Literature review

2.1. Cooperative advertising and channel coordination

A number of papers study the cooperative advertising for the channel coordination in the literature. For example, Huang, Li, and Mahajan (2002) study cooperative advertising in a manufacturer–retailer supply chain without considering price. They demonstrate that cooperative advertising plays a more important role on the supply chain performance in a partnership. Karray and Zaccour (2006) examine the impact of cooperative advertising on firm's performance when the retailer introduces a private label to market. Their results reveal that the retailer would accept the cooperative advertising program only if the private label has a strong competition with the national brand. Yan (2010) shows that cooperative advertising helps improve the performances of both the manufacturer and the e-retailer effectively. Aust and Buscher (2012) reveal that vertical cooperative advertising in a cooperation relationship can help the manufacturer–retailer supply chain achieve the highest total profits and lead to lowest retail price for consumers. Furthermore, Jogensen and Zaccour (2014) and Aust and Buscher (2014) provide a good summary of work in cooperative advertising by discussing the studies done by Berger (1972), Berger and Magliozzi (1992), Li, Huang, Zhu, and Chau (2002), Yue, Austin, Wang, and Huang (2006), Karray and Zaccour (2006, 2007), Xie and Wei (2009), Yan (2010), He, Krishnamoorthy, Prasad, and Sethi (2011, 2012), Aust and Buscher (2012), and Zhang, Gou, Liang, and Huang (2013). The aforementioned papers all focus on commonly defined cooperative advertising in which the retailer decides how much to spend on local advertising and the manufacturer shares the cost of invested advertising, while our research focuses on manufacturer's cooperative advertising in which the manufacturer decides how much monetary support should be provided to the retailer to implement a local advertising campaign and the retailer pays a zero percentage cost of invested advertising. In addition, there are several major differences between the aforementioned papers and ours. First, the aforementioned papers do not focus on the issue of online vs. traditional channel competition, while we do. Second, the aforementioned papers do not address the strategic role advertising plays in the dual-channel (online vs. traditional channel) distributions, while we do. Third, the aforementioned papers do not consider the market uncertainty and the strategic importance of information, while we do. Finally, the aforementioned papers do not address how the advertising stimulates the retailer to distort its information in the information sharing, while we do.

2.2. Information sharing in the dual-channel distributions

A few studies examine information sharing between the retailer and the manufacturer in the environment of dual-channel distributions. Yue and Liu (2006) show that both the manufacturer and the retailer can benefit from information sharing only when the manufacturer's forecast is higher than the retailer's forecast. If the manufacturer's forecast is lower than the retailer's forecast, the manufacturer would benefit from information sharing while the retailer would not. Yan and Ghose (2010) examine the effect of forecast information accuracy on the performances of traditional and online retailers in the dual-channel distributions. Yan and Pei (2011) find that information sharing has a positive impact on the manufacturer, but has no impact on the retailer. The aforementioned papers do not address the important value of advertising in the dual-channel distributions, while we do. Furthermore, the aforementioned papers do not address the issue of information distortion when supply chain players share their information. In contrast, we address the issue of information distortion while sharing information and propose an effective mechanism to eliminate any possible information distortion, so that both firms can achieve an optimum profit.

To our knowledge, our research is the first one to address how the manufacturer's cooperative advertising coordinates the dual-channel distributions in an environment of demand uncertainty and involves in the information sharing and distortion in the extant literature. Specifically, when the manufacturer opens an online channel to compete with its retailer and provides a monetary support to the retailer to implement a local advertising to stimulate the market sales, the main questions addressed in our research can be summarized as follows:

(a) Is it profitable to the manufacturer to provide a monetary support to the retailer to implement a local advertising campaign when there is no sharing of information or sharing of information?
(b) Would both the manufacturer and the retailer benefit from their information sharing unconditionally, when the manufacturer's cooperative advertising is considered? If not, what condition(s) can be derived?
(c) How does the manufacturer's cooperative advertising motivate the retailer to distort its shared information while the manufacturer has a motivation to understate its forecast at the same time? What effective mechanism can be utilized to solve the problem of distortion of information and help the manufacturer and the retailer achieve an optimum profit?

Based on our results, we derive optimal market strategies for both the manufacturer and the retailer to employ. Thus, business managers can benefit from our findings.

3. Model framework

In this paper, we consider a supply chain made up of a manufacturer and a traditional retailer. The manufacturer opens an online channel to sell its product directly to consumers. Consumers can buy products from either the online channel or the retailer. We assume that the manufacturer and the retailer play a Stackelberg game, in which the manufacturer is the leader and the retailer is the follower. Empirical study (Cotterill & Putsis, 2000) shows that Stackelberg structure reflects a strategic interaction between the manufacturer and its retailer.

When consumers buy from online, we consider an important parameter $g (g > 0)$ in our model. The parameter g represents the product compatibility to the web, which is the compatibility of the product with online sales based on the characteristics of the product and the nature of online channel. A substantial body of literature (e.g., Chiang, Chhajed, & Hess, 2003; Yan, 2011) indicates that when the same product is purchased through an online channel, consumer's consumption value (i.e., amount willing to pay) about this product would be less than the identical product purchased through a traditional channel. Kacen, Hess, and Chiang (2002) provide further evidence that the product compatibility to the web, based on empirical analysis of data, turns out to be less than one for many product categories. The products that have a strong compatibility to the web often sell well online (e.g., books, digital products, magazines, software, and computers). However, few daily foods, beverages, autos, and real estates are sold online. In this study, our research focuses on these products with the value of product compatibility to the web in the interval of $0 < g < 1$.

3.1. Dual-channel model with manufacturer's cooperative advertising

Suppose the product is sold through an online channel at price p_1 and through a traditional channel at price p_2. The consumer's consumption value is assumed to be v. Thus, the consumer surplus through the traditional channel would be $v - p_2$. All consumers whose consumer surplus through the traditional channel is positive (i.e., $v - p_2 \geq 0$) will consider buying through the traditional channel. The marginal consumer whose consumption value v^r equals p_2 is indifferent to buying through the traditional channel (or not). The consumption value of consumers when the product is purchased through online would be less than v. We capture the decrease in value by the parameter g. We assume that the consumer's consumption value of the product when purchased

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