Pricing decisions and strategies selection of dominant manufacturer in dual-channel supply chain

Lidan Ma, Rong Zhang, Sandang Guo, Bin Liu *

Department of Management Science, Henan Agricultural University, Zhengzhou, 450002, China

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ABSTRACT

This paper investigates the dominance strategies exerted by the dominant manufacturer for maintaining its dominant position in the channel system which is operating substitutable products and what influences they have on members of the whole channel system and the consumers. As to the channel system with two manufacturers and one retailer, the pricing decisions are depicted to compare the optimal choices made by the system members under the dominant manufacturer's wholesale price dominance strategy and channel dominance strategy, respectively. It shows that only the dominant manufacturer can necessarily benefit from the wholesale price dominance strategy. Furthermore, both dominant manufacturer and retailer can benefit from the channel dominance strategy, and consumers can also benefit from it. The channel dominance strategy, however, is not always the optimal choice for the dominant manufacturer. Whatever dominance strategy is it, the weak manufacturer will suffer loss, but in the channel dominance strategy, the market share proportion of the weak manufacturer will increase under certain circumstances.

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1. Introduction

With the improving of living standards and accelerating of globalization of economy, the species of commodity have been becoming more and more diversified and personalized, and then the competition among manufacturers, even supply chains, has been also fiercer. Retailers, such as large-scale supermarkets, stores and small shops, operate different alternative products to satisfy the personalized needs of customers, thus alleviating the direct competition among manufacturers. When the substitutability is high, manufacturers prefer selling their products through dependent retailers instead of direct distributors or exclusive retailers, so the channel supply chain with one retailer and two or more manufacturers is very common in reality. Since some dominant manufacturers are in an advantaged position in supply chains, they adopt certain dominance strategies in order to maintain and enlarge this leading superiority. For instance, the competition in the soft drink market among Coca-cola, Pepsi and others, has always been intense, although Coca-cola has firmly held the first position, it also takes price strategy from time to time due to the competition. In 2011 Coca-cola raised its prices three times and reduced price once, although there were cost reasons, market competition strategies counted for a great deal in order to capture markets with its competitor Pepsi. And, to maintain its monopoly position in global chip market, Intel slashed prices to against AMD, the second largest chip maker in the world. Furthermore, as the greatest

commodity company, P&G took the lead in cooperating on channel with Wal-Mart to keep its dominant position. Such a collaborative relationship is fostered not just by Wal-Mart and P&G. For instance, many suppliers collaborates with Costco, which sets up a centralized POS sales and inventory database that allows participating suppliers to manage inventory and sales data more effectively from a single, central location. Sears used to follow an explicit policy of charging low prices, over the years, in favor of a policy of collaborating with suppliers like Kenmore and Michelin. Our questions are: What effects do dominance strategies exerted by dominant manufacturers have on the whole supply chain? Will the retailer and the weak manufacturer benefit or suffer from it? What's the dominant manufactures' optimal choice?

During the past two decades, supply chain management has been focused on random demand market environment and the derivation of upstream and downstream channel coordination problems (Cachon, 2004; Khouja, 1999). With the market competition becoming more intense than before, however, a dual channel supply chain have also arose scholars' attention. In the dual channel supply chain, there are two main research questions: who should be the leader in the Stackelberg game between the manufacturer and the retailer in the channel? How does the competition between the two channels influence pricing strategy? Choi (1996) deals with a channel structure in which there are duopoly manufacturers and duopoly common retailers. Cai (2010) studies the influence of channel structures and channel coordination on the retailer, the supplier and the entire supply chain in the two single-channel and two dual-channel supply chains. The analysis suggests the preference lists of the supplier and

the retailer over channel structures with and without coordination are different, and depend on parameters like channel base demand, channel operational costs, and channel substitutability. Zhang et al. (2012) investigate the influences of products' substitutability and channel position in two dual-exclusive channels. It shows that no power structure is always the best for the entire supply chain, and the vertical Nash game is equilibrium for the members. Ingene and Parry (1995a,b, 2000), Iyer (1998) analyze the channel coordinating problems in retailer competition environment. Tsay and Agrawal (2000) consider the supply chain coordination under retailers' price and service competition circumstances when one manufacturer provides products to two independent retailers. They characterize the structure of wholesale pricing mechanisms that can coordinate the system. With the rapid development of electronic commerce and third-part logistics, more and more suppliers are beginning to set up direct-sale channel, therefore more and more scholars are doing related researches concerning this issue. Dumrongsiri et al. (2008) investigate the pricing decisions in dual-channel supply chain and finds conditions for manufacturers to join in direct channel. Cattani and Gilland (2005) show the manufacturer's and retailer's pricing strategies from the perspectives of direct channel and traditional channel.

Researches on manufacturers' horizontal competition are rare, and most literatures focus on single-channel supply chain where retailers only sell products from one single manufacturer, which neglects the facts that in most consumer markets retailers sell different (highly substitute) brands of products which can imitate many markets including specialty shops, supermarkets and small shops. Chan Choi (1991) uses a Stackelberg model which includes two competitive manufactures and one common retailer to analyze the chain members' profits differences in linear demand function and nonlinear demand function. The issue of supply chain coordination mechanism of two manufacturers providing products to one retailer is studied in Hsieh and Cheng-Han (2009). They set three coordination models—revenue sharing, return policy, and combination of revenue sharing and return policy—and contrast them with a basic and uncoordinated model. Paralar and Wang (1993) sets up an analytical model of one retailer and two suppliers under the assumption of random production.

Another relevant stream of literature looks into dominant retailers. With the emergence of some large-scale retailers, such as Wal-Mart, GOME, Suing, etc., researches about dominant retailer have also increased gradually in recent years, but researches about dominant manufacturer are very rare. Geylani et al. (2007) model a fixed-size market scenario where the manufacturer is dictated the wholesale price by the dominant retailer but sets the wholesale price for the weak retailer. Dukes et al. (2006) show that the optimal strategy for the weak retailer is to improve diversity through wide spreads of species. Raju and Zhang (2005) investigate how a manufacturer can coordinate the channel in the presence of a dominant retailer, which through either quantity discounts or a menu of two-part tariffs. Iyer and Villas-Boas (2003) examine a bargaining framework in a bilateral monopoly and show that there are conditions in which the presence of a powerful retailer might benefit both players. Kinshuk et al. (2007) investigate the dominant retailer's choices of dominant strategies which are market dominance, channel dominance and dual dominance and their influences on other channel members.

Along with the above literature, it can be seen that at present researches on dual channel supply chain with dominant manufacturer are still relatively rare. So to differ from existing literature, this paper will focus on the dominant manufacturer's choice of dominance strategies and their influences on channel members and consumers as to the channel system with two manufacturers and one retailer operating different alternative products. Mainly two dominance strategies that are most common in practice are investigated i.e. wholesale price dominance strategy and channel dominance strategy.

2. The model

The following three models are considered

Benchmark Case—no dominance: the dominant manufacturer does not exert any kind of dominance, denoted by "b".

Wholesale price dominance strategy—the dominant manufacturer always charges higher/lower wholesale price to the retailer than that of the weak manufacturer, denoted by "w".

Channel dominance strategy—the dominant manufacturer cooperates with the retailer, jointly decides the wholesale price and reallocates the retailing profit based on their relative bargaining powers, denoted by "c".

The game has three players, the dominant manufacturer (denoted by D), the weak manufacturer (denoted by W) and the retailer (denoted by R). Both manufacturers sell differentiated and substitute products through the retailer, and the dominant manufacturer (D) and the weak manufacturer (W) charge unit product wholesale prices ω_D and ω_W to the retailer(R) respectively. The retailer charges consumers retail prices p_D and p_W. The dotted line indicates the competitive relation between the two manufacturers. Additionally, the operational and production costs for the manufacturers and retailer are normalized to zero (Fig. 1).

Following Singh and Vives (1984), we demand curves for two differentiated products.

$$p_D = a - q_D - \beta q_W,$$
$$p_W = 1 - q_W - \beta q_D.$$

That is,

$$q_D = \frac{a-\beta}{1-\beta^2} - \frac{1}{1-\beta^2}p_D + \frac{\beta}{1-\beta^2}p_W,$$
$$q_W = \frac{1-a\beta}{1-\beta^2} - \frac{1}{1-\beta^2}p_W + \frac{\beta}{1-\beta^2}p_D.$$

The game models the dominant manufacturer by having a larger market share than the weak manufacturer that is $a > 1$. $\beta \in [0,1]$ denotes the products substitutability. $\beta = 1$ means that products are fully substitutable while $\beta = 0$ means the products are fully differentiated. Unless β is zero, prices are strategic complements. As β increases, the price sensitivity increases and hence the intensity of competition increases.

3. Benchmark case-no dominance

In the benchmark case, the dominant manufacturer does not exert any kind of dominance. Except for the product's market share, both manufacturers are symmetric in all respects. The decision-making is two stages: the Stackelberg game process in which the dominant
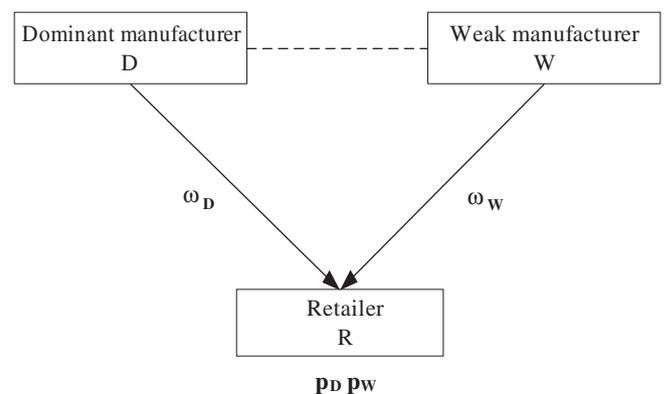

Fig. 1. Dual-channel supply chain system.