



## Decision Support

## Pricing and alliance selection for a dominant retailer with an upstream entry

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## ARTICLE INFO

## Article history:

Received 7 November 2013

Accepted 3 November 2014

Available online 13 November 2014

## Keywords:

Pricing

Alliance choice

Supply chain management

Game

## ABSTRACT

We consider the problem of pricing and alliance selection that a dominant retailer in a two-echelon supply chain decides when facing a potential upstream entry. The two-echelon supply chain consists of a dominant retailer, an incumbent supplier and an “incursive” vendor, where both the incumbent supplier and “incursive” vendor sell substitutable products to the common market through the dominant retailer. Our objective is to discuss whether the dominant retailer should sell the “incursive” vendor’s products and, if so, how the dominant retailer strategically selects the alliance structure to maximize his/her own profit. We also present how all the members make their pricing decisions and analyze the impact of competitive intensity between two products on their pricing strategies after the entry of the vendor in possible alliance settings. Our results show that: (1) the introduction of the upstream vendor always benefits the retailer, and more interestingly, benefits the incumbent supplier in many cases, too; (2) in this paper, we define the competitive ability as the price dominance of one player over another when both are competing for the same customer market, if the price competition between the incumbent supplier and the “incursive” vendor is relatively fierce, the dominant retailer should ally with the one who has a relatively strong competitive ability rather than the other who has a relatively weak competitive ability; otherwise, he/she should ally with both upstream members. Finally, using numerical examples, we analyze the impact of different parameters and provide some management insights.

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## 1. Introduction and literature review

In the supply chain management literature, the coordination issue has been extensively analyzed. Most of studies argued that the co-operation/coordination between all members of supply chain could make the pie bigger. Consequently, there emerge a lot of coordination mechanisms, such as quantity discounts (Monahan, 1984), credit option (Sarmah, Acharya, & Goyal, 2008), buy-back/return (Pasternack, 1985; Taylor, 2002) and revenue sharing (Cachon & Lariviere, 2005), etc. However, the above literature did not consider the effects of a possible incursion of a firm outside a supply chain on the profits or cost of the incumbent members in the supply chain. As we all know, the entry of new members or exit of existing members is very common in practice. For example, in the semiconductor industry, five big incumbent firms dominated almost half of the ASIC market in 1999, such as IBM (11 percent), Lucent (10.9 percent), NEC (10.5 percent), LSI Logic (9.3 percent) and Fujitsu (7.2 percent). However, with the evolvement

of the industry, recently smaller firms are easy to reduce the barrier to entry of semiconductor industry via subcontract of manufacturing.<sup>1</sup> Hence, it is common that one buyer in semiconductor industry purchases products from either incumbent suppliers (e.g., IBM, NEC) or entrant suppliers (e.g. Samsung, Toshiba) (refer to Cho, Kim, & Rhee, 1998). This gives rise to several interesting discussions: (i) with the entry of a new incursive member, how should the incumbent members in the supply chain adjust their operations? (ii) For the dominant retailer, should he/she choose to cooperate with the incumbent supplier or/and the new invader? For the incumbent supplier, whether does he/she compete against or cooperate with the new invader? To best of our knowledge, the existing related literature has not addressed these questions. The goal of this paper is to cover this gap.

## 1.1. Relation to the literature

Literature on supply chain management is very plentiful. Researchers (such as Corbett, Zhou, & Tang, 2004; Ertek & Griffin, 2002;

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<sup>1</sup> Refer to <http://www.ukessays.com/essays/marketing/an-analysis-of-the-semiconductor-industry-marketing-essay.php>.

Leng & Parlar, 2005, etc.) have presented excellent surveys for the literature in the field of supply chain management. Among these researches, most of them discussed two-echelon supply chain, where a manufacturer/supplier wholesales a product to a retailer/buyer who then retails it to the end consumers. Moreover, in many researches, the supplier is usually assumed to be a dominator, i.e., the supplier implements the “supplier-Stackelberg” ([sS]) game (Arcelus & Srinivasan, 1987; Wang, 2002; Zhou, Min, & Goyal, 2008). In reality, however, the upstream supplier is not always more powerful than its downstream retailer. Sometimes it happens that the upstream and downstream players have nearly equal power, such as Intel and IBM/Compaq, but the downstream retailer may be a dominator, such as Wal-Mart. Therefore, there also exists some literature on supply chain management, which employed the vertical Nash game (Chu & Messinger, 1997; Hisashi, Yao, & Liu, 2007) or a “retailer-Stackelberg” ([rS]) game (Choi, 1991; Lau, Lau, & Wang, 2007; Tsay, 2002; Wang, Lau, & Lau, 2009). However, all these researches assumed that the number of firms in a supply chain is given as well, i.e., they ignored the effect of potential entry on supply chain management. In this paper, the important differences are that in a [rS] game, we analyze the pricing and alliance selection issues of a two-echelon supply chain by considering the entry of new upstream firms. Hence, in what follows, we mainly review the literature that is directly related to the entry issue on supply chain management.

The literature on the entry issue can be classified as two categories: single-echelon and two-echelon. In single-echelon model, most of studies considered such a situation that a single monopolized incumbent already occupies one market while a new entrant is planning to enter the same market. From the incumbent’s perspective, lots of strategies were presented, such as pricing (Arbatskaya, 2001; Hauser & Wernerfelt, 1988), advertising (Ishigaki, 2000; Schmalensee, 1983), investing on R&D of new technologies (Lukach, Kort, & Plasmans, 2007), and using location as a signal of cost (Boyer, Mahenc, & Moreaux, 2003). There also has some literature on the entry issue from other perspective in single echelon setting. For example, Seade (1980) studied the effect of entry on the profits of incumbent firms and the performance of supply chain. Aoyagi (1996) established a long-run multi-period model where an incumbent firm may change ownership in each period and discussed the role of changing ownership of a long-run firm facing a sequence of potential entrants to its market. Arping and Diaw (2008) studied the effect of sunk cost on an incumbent firm who has the possibility of liquidating assets and exiting the market. Additionally, a few papers consider the case there are multiple incumbents. For instance, Bagwell and Ramey (1991) considered pricing strategy among multiple incumbents with the entry of new firm. Ashiya (2000) studied the optimization problem of an incumbent firm who faces two entrants: a weak one and a strong one.

For the two-echelon models, there are only a few literatures about the entry issue. Tyagi (1999) considered a two-echelon supply chain where  $n$  incumbent retailers buy a product from an incumbent supplier and then sell the product to consumers. His paper mainly analyzed the effect of entry in a retailing market on pricing and profits of incumbent firms. Schultz (1999) studied a vertical structure including an incumbent supplier, an incumbent retailer and a potential entry retailer; Xiao and Qi (2010) developed a model of considering how an incumbent supplier to deter the entry of a potential supplier under uncertain demand. They showed that the supply chain structure may affect the deterrence strategy of the incumbent supplier. Liu and Zhang (2006) discussed that whether an incumbent retailer has an incentive to deter the supplier from selling in the consuming market when an incumbent supplier may potentially enter the retailing market. This paper considered a two-echelon supply chain consisting of an incumbent supplier, a potential “incursive” vendor and an incumbent dominant retailer. The incumbent supplier and “incursive” vendor sell the substitutable products to consumers through the common retailer. Different from their researches, in this paper

we mainly discuss whether the dominant retailer should sell the “incursive” product, and how the retailer utilizes the upstream entry to strategically select the alliance structure so that he/she can get as more benefits as possible. Note that our paper is also different from some existing literatures related to channel selection, such as Cai, Zhang, and Zhang (2009), Cai (2010), etc., where they studied whether the supplier benefits from adding a new direct channel to the traditional single-channel supply chain.

## 1.2. Summary of results

In this paper, we consider a two-echelon supply chain, where an incumbent supplier sells products through an incumbent dominant retailer. Suppose an “incursive” vendor also hopes to sell his/her products through the same retailer in the same market. The products of both the supplier and the vendor are substitutable. We answer whether or not the retailer should agree to sell the “incursive” vendor’s product. We also discuss the effect of the “incursive” vendor’s entry on the pricing schemes and profits of the incumbent retailer and supplier. Furthermore, we discuss the alliance selection issue of the dominant retailer. That is, when the “incursive” vendor is entering into the market, whether the retailer should choose to ally with the incumbent supplier or “incursive” vendor? If so, with whom does the retailer prefer to ally?

The main contributions of this paper include the following three aspects. First, we discuss pricing issues in a two-echelon supply chain with the upstream entry, whereas most of the existing two-echelon models analyzed pricing issues in the setting of the downstream entry. Second, under each of possible alliance settings, we study whether the dominant retailer should sell the “incursive” vendor’s product. Our analytical results show that the retailer as the dominant in supply chain has incentives to sell the “incursive” vendor’s product under any possible alliance setting. Furthermore, not only the dominant retailer always prefers much fiercer price competition between the incumbent supplier and the “incursive” vendor, but also the incumbent supplier prefers to compete more fiercely against the “incursive” vendor in many cases. The former is consistent with our intuition but the latter seems opposite to our expectation. Third, most of researches on the entry issue focus on how the incumbent firm deters the potential entrant to enter the market, whereas we discuss how the incumbent dominant retailer selects the alliance structure to maximize his/her profit by means of the upstream entry. Our analytical results show that when facing the “incursive” vendor’s entry into the upstream wholesale market, the best option for the dominant retailer is to ally with one or both of the incumbent supplier and the “incursive” vendor. Specifically, if the price competition between the incumbent supplier and the “incursive” vendor is relatively fierce, the dominant retailer should ally with the one who has a relatively strong competitive ability<sup>2</sup> rather than the other who has a relatively weak competitive ability; otherwise, he/she should ally with both upstream members. This exactly explains why sometimes retailers, like Wal-Mart and Carrefour, ally with store brand suppliers but compete against national brand suppliers.

The remainder of this paper is organized as follows. The problem formulation is presented in Section 2. Given the dominant retailer is willing to sell the “incursive” vendor’s product, Section 3 discusses the pricing strategies of the members in two-echelon supply chain and the impact of competition on their pricing strategies under various alliance settings. Then, Section 3 further analyzes whether the dominant retailer is willing to sell the “incursive” vendor’s product under different alliance structures. The optimal alliance option strategy for the dominant retailer is discussed in Section 4. Numerical

<sup>2</sup> In this paper, we define the competitive ability as the price dominance of one player over another when both are competing for the same customer market.

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