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Optimal depth and timing of price promotions in a vertically differentiated product line

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ABSTRACT

When a monopoly consumer packaged goods seller contemplates a temporary price decrease to promote a particular product, the decision is complicated, due to the potential impacts on demand for its other products. Yet limited research details how a monopoly seller should promote its offerings of different quality. This article proposes a model in which consumers switch from a low- to a high-quality offering in the product line when the latter's price is temporarily reduced. According to this model, the price promotion offers consumers a chance to learn about the high-end option, and some trials will lead to sufficient liking of the high-quality offering that they will continue purchasing it, even after it reverts to its regular (non-promotional) price. However, the quality expectations of these repeat buyers increase, which narrows the positive disconfirmation gap. Eventually, these consumers return to the low-quality option. With these assumptions, the current study determines a dynamically optimal (profit-maximizing) product line pricing and promotion strategy for a seller, which in turn has implications for consumer surplus. Contrary to conventional wisdom, overall consumer surplus decreases over the optimal price promotion cycle. A model extension also investigates a periodical promotion strategy for low-end products, in an effort to induce non-buyers to consume; the seller's profit also improves with this strategy.

1. Introduction

Price promotions are important elements of a firm's marketing mix, prompting substantial attention in both research and practice. Many researchers investigate how price promotions affect brand choice, brand sales, or market expansion in both the short- and long-run (e.g., Blattberg & Wisniewski, 1989; Nijs, Dekimpe, Steenkamp, & Hanssens, 2001). These studies mainly emphasize the effects of such promotions in the face of horizontal competition. However, even for a monopoly seller that carries multiple products, of varying quality, in one product line, vertical competition exists and must be accounted for when designing price promotions for individual offerings. The problem grows even more complicated because consumers learn and forget information about products through their usage experience (Villas-Boas & Villas-Boas, 2008). These effects are particularly prominent in consumer package goods (CPG) settings, yet little prior literature provides guidelines for optimal product line price promotion strategies (Allender & Richards, 2012).

A monopoly CPG seller likely creates a product line that appeals to different consumer segments, ranging from high- to low-quality options (Moorthy & Png, 1992). The seller's ultimate objective is to maximize his/her overall product line profit, rather than the profit of any single product. For this investigation, we consider the dynamically optimal pricing and price promotion strategy for a two-product line of a CPG seller, when the objective is to maximize overall category profit (Basuroy, Mantrala, & Walters, 2001). In this study, we first focus on the promotional pricing strategy for the high-end, higher-priced product, which should temporarily shift regular consumers of the low-end product to consume the high-end product. In a model extension, we investigate the possibility of applying this periodical promotion strategy to low-end products, to shift non-buyers to become consumers of low-end products temporarily. Accordingly, with this article, we address four main research questions:

RQ1. From existing consumers, at both low-end and high-end, can a seller gain profits by issuing a temporary price promotion on the high-end product, where the regular prices of high- and low-end products are both treated as exogenous (static perspective)?

RQ2. From a dynamic perspective, what are the optimum depth, timing, and frequency of high-end product price promotions over a multi-period horizon? How do regular prices deviate from these optimal

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levels if no promotions are offered?

RQ3. Do consumers benefit (i.e., increased consumer surplus) from price promotions of the high-end product?

RQ4. Does the seller benefit (i.e., market extension) from a temporary price promotion of the low-end product?

With a dynamic model, we incorporate a carryover effect of a promotion in the previous period on responses in the current period, according to a learning process that is similar to that predicted by Freimer and Horsky (2008) and Villas-Boas and Villas-Boas (2008). Many studies have established support for a carryover effect of price promotions in post-promotion periods (e.g., Cotton & Emerson, 1978; Nijs et al., 2001; Silva-Risso, Bucklin, & Morrison, 1999; Sogomonian & Tang, 1993), such that the lift in sales due to a price promotion persists for at least one more period, even after the regular price is restored.

Accordingly, in the next section, we review relevant literature pertaining to retail price promotions to establish our model. We then develop and analyze a product line profit–maximizing model to investigate our four research questions. Our model analysis produces several propositions for optimal product line pricing and high-end (and low-end) product price promotions over time. Finally, we conclude with a summary of our results, managerial implications, some limitations, and directions for further research.

2. Relevant theoretical literature review

Narasimhan's (1988) seminal model of competitive price promotion strategies assumes two competing firms (duopoly), each with one brand that has a monopoly market (loyal consumers) and competes with others in a common market, whose consumers are brand switchers. In this setting, the behavior of brand switchers drives the equilibrium behavior of duopolists (Bawa & Shoemaker, 1987). Narasimhan hypothesizes and shows analytically that these firms shift their prices over a range (where any deviation away from a maximum price constitutes a promotion) to induce brand switchers to buy their products while also minimizing any loss of profits from loyal consumers. This model establishes how brand switchers' behaviors and the size of the loyal consumer market determine the appropriate depth and frequency of promotions offered by two competitors. To analyze promotions in a single product line, similar to Narasimhan (1988), we assume a market for two vertically differentiated products of a line, which is comprised of segments of consumers who are loyal to the low-end product or the high-end product, though both products are owned by the same seller. We also allow for a segment of low-end consumers who can be attracted to purchase the high-end product when it is offered at a price discount. These “switchers” then switch back, sooner or later, to the low-end product after the high-end price reverts.

Some critical assumptions in our model and analyses follow insights from Freimer and Horsky (2008), Villas-Boas (2004), and Villas-Boas and Villas-Boas (2008), who focus, like Narasimhan (1988), on explaining periodic price promotions. Their models suggest that a continuous process of consumer learning drives periodic price promotions. Specifically, price-sensitive consumers, who normally purchase a low-priced brand, likely respond to price promotions of a higher-priced brand and learn about its product attributes from their consumption experience, such that they may continue to buy it, even at the regular price, if they learn that the benefits of this product are worth the higher price. That is, the promotion has a carryover effect. Freimer and Horsky (2008) call it a “try it, you will like it” process, which they acknowledge as a frequent managerial rationale for price promotions. Therefore, Freimer and Horsky (2008) propose a model that specifies such learning, and they show analytically that it is optimal for a monopolist national brand firm to vary its price periodically from high to low, rather than stay at a fixed price, especially in an expandable market. For a monopolist, the “try it, you will like it” scenario achieved by periodically offering price promotions is beneficial, provided that the learning by consumers reaches a sufficient magnitude. If there is no (or only weak) learning, the monopolist should maintain a single, constant price.

Villas-Boas and Villas-Boas (2008) also emphasize that learning is accompanied by forgetting, and these two phenomena together can explain why sellers periodically promote, but also imply an optimum interval between sales and an optimum duration for each sale. In Villas-Boas and Villas-Boas's model, consumers are uncertain about their valuation of a product due to forgetting, and they are willing to try it to find out how well the product fits their preferences only if it is priced at a sufficiently low level. If consumers learn that the product fit is high (i.e., they “like it”), they are willing to pay more, so the seller may be able to get these informed consumers to buy again at the regular price. This offers a rationale for a seller to temporarily cut its price to induce consumers to try and learn about the product.

In this study, we decompose consumer's learning process into two dynamic parts: *learning the product's quality* and *updating their quality expectation*. Theories in disconfirmation paradigm and customer satisfaction further support this argument of dynamic learning (Oliver, 1980; Oliver & Swan, 1989; Sivakumar, Li, & Dong, 2014). That is, prior to using a product, consumers form performance expectations. After using the product, they compare their performance perceptions with their expectations. Performance better than expected induces positive disconfirmation (performance perception $\geq$ expectation); performance worse than expected leads to a negative disconfirmation (performance perception $<$ expectation). A consumer's incremental satisfaction is a direct function of a positive disconfirmation. In a subsequent period, even at a regular price, some consumers who have experienced high positive disconfirmation can be retained (Freimer & Horsky, 2008; Villas-Boas & Villas-Boas, 2008). Not all consumers with positive disconfirmation can be retained; the regular price still deters some of them from making a consecutive purchase if their positive disconfirmation is not high enough. Therefore, “very satisfied” customers are the targets for retention at the regular price.

Next, when the consumption happens repeatedly, consumers update their expectations over time (Sivakumar et al., 2014). Thus, expectation is not constant in our sequential dynamic study scenario. The positive disconfirmation derived from the high-end product promotion may alter expectations for a new episode (Sivakumar et al., 2014; Zeithaml, Berry, & Parasuraman, 1993). When positive disconfirmation occurs, reference levels shift upward (Thorndike, 1913), but perceived performance remains unchanged. Therefore, consumers' positive disconfirmation score (i.e., perceived performance – updated expectation) diminishes, and some of them may choose to switch back to the low-end product.

Consumers' forgetting of their valuation for the product is more likely in the case of products that have longer purchase cycles, lower consumer involvement, or greater complexity. Decay theory (Thorndike, 1913) posits that memory fades due to the mere passage of time. In Villas-Boas and Villas-Boas' (2008) conceptualization, as time passes, the number of consumers who have forgotten their valuation about the high-end product from the last cycle may reach a level, where it again pays the firm to cut its price to induce these consumers to try the product again and re-evaluate it. Thus, consumer learning and forgetting can motivate periodic promotions. A higher forgetting rate may require more frequent promotions. Forgetting the experience requires another promotion to kick in, so that the consumer could be induced to ‘try’ again.

Our analytical model thus clearly is inspired by Freimer and Horsky (2008) and Villas-Boas and Villas-Boas (2008). Both of these former studies model the dynamic promotion strategy of a single product, whether in a monopoly market (Villas-Boas & Villas-Boas, 2008) or a competitive duopoly market (Freimer & Horsky, 2008). To advance their findings, we extend the notion of a dynamic promotion strategy from a single product context to a product line context with two