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Optimal pricing and advertising strategy for introducing a new business product with threat of competitive entry

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Abstract

The problem of optimal joint pricing and advertising decision making for a new product facing potential competitive entry has received inadequate attention. We propose a model that attempts to find the optimal price–advertising frontier in the face of potential competitive entry that maximizes total discounted profits for pre- and post-entry periods. We find that a firm would charge the price that equates price elasticity to marginal revenue product of advertising (as predicted by [Dorfman, R. and Steiner, P.O. (1954), Optimal Advertising and Optimal Quality, *American Economic Review*, 44(5), 826–836.]) only when the potential effects of pricing and advertising on its market share are not considered. Under optimal conditions, aware that market share is subject to erosion, the firm charges a somewhat lower price than the profit maximizing price, and sets an advertisement expense that is somewhat higher than the profit-maximizing advertising level as predicted by Cournot's monopolistic setting. We illustrate the applicability of our model using business product examples taken from several industries including operating systems, software, pharmaceutical, and telephone switching. Directions for future research with implications for B2B managers (for example, the possible effects of preannouncement to forestall competitive entry) are discussed.
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1. Introduction

The problem of optimal pricing for new products in different market structures has been studied at length in the literature (e.g., Bass & Bultez, 1982; Bayus, 1992; Dockner & Jorgensen, 1988a; Eliashberg & Jeuland, 1986; Krishnan, Bass, & Jain, 1999; Krishnan, Bass, & Kumar, 2000; Narasimhan, 1989; Rao & Bass, 1985). An early study by Kalish (1983), for example, proposed a model of pricing for a monopolist, deriving optimal prices through time using optimal-control methods. Dockner and Jorgensen (1988a) developed a similar model for the oligopoly, though without incorporating the possibility of new entrants. More recent studies (e.g., Kalra, Rajiv, & Srinivasan, 1998) have examined the optimal pricing decision in the face of entry by potential competitors.

A parallel stream of research addresses the issue of optimal advertising for new products (Horsky & Mate, 1988; Horsky & Simon, 1983; Teng & Thompson, 1983). In classic articles, Simon (1982) and Mahajan and Muller (1986) modeled the effects of different dynamic advertising patterns, comparing constant advertising against pulsing advertising through time, though these articles did not specifically examine new product advertising decisions. Other studies have modeled advertising strategy for the new product situation (e.g., Dockner & Jorgensen, 1988b; Teng & Thompson, 1983) and also advertising in an oligopoly (Erickson, 1985; Horsky & Mate, 1988). Some of these models (e.g., Horsky & Simon, 1983; Kalish, 1985) are modifications of the original Bass (1969) new product diffusion model, extended to include advertising effects. To a lesser extent, the problem of joint pricing and advertising for new and existing products has been studied (Kalish, 1985; Rao, 1985; Thompson & Teng, 1984; Vilcassim, Kadiyali, & Chintagunta, 1999), though this stream generally does not explicitly consider potential competitive entry.

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By contrast, however, the problem of a joint pricing and advertising policy in the context of introducing a new business-to-business product, taking into account the possibility of potential competitors threatening to enter the market, has found inadequate attention in the literature. This paper specifically addresses this problem; our research objective is to develop and illustrate a model that attempts to find an optimal price–advertising frontier for a firm launching a new product in the face of entry by potential rivals that maximizes the firm's total discounted profits for pre- and post-entry periods. The problem of determining optimal pricing and advertising for new products in the face of competitive entry so as to maximize total (pre- and post-entry) profits is important to marketing practitioners and is also relevant in the areas of business policy and competitive economics. It is particularly relevant to marketing practitioners in the B2B sector, as extant models in the literature as most of the models discussed in the abovementioned research papers are either empirically tested in the consumer market, or are conceptual in nature and are not specific to either the consumer or B2B setting. The question of the optimal price–advertising frontier is especially important in the context of introducing new products when the firm, by modifying its pricing and advertising policies, can influence the time when competitors are most likely to enter the market. In the computer software industry, for example, "vaporware" (early preannouncement of upcoming releases) is commonly used by both large and small firms to gain competitive advantage. Heavy vaporware advertising by the firm announcing the new product may make it difficult for other competitors to establish a position in the market, especially if the business customer faces high switching costs, and may delay competitive entry or forestall it altogether (Bayus, Jain, & Rao, 2001; Eliashberg & Robertson, 1988). (This is very realistic in the business software industry, where long-term commitments for product and supporting services are often made, resulting in extremely high switching costs and high customer retention rates.) The time of entry by competitors is of crucial importance to the firm introducing the new product since its total discounted profit stream is likely to be different between the pre- and post-entry periods affecting its total discounted profits taking into account both the time periods.

In the basic marketing literature (e.g., Kotler, 2003, pp. 473–475), the pricing and advertising alternatives at the time of launch are usually characterized as (1) a premium price strategy, supported by high promotional expenses, sometimes followed by price decreases through time (price skimming) and (2) a penetration (more moderate) price strategy supported by a more modest promotional campaign. Each alternative has its competitive consequences. A penetration price, for example, can be a deterrent to competitive entry (if it is perceived that little margin can be made in the product category), but may result in the innovating firm receiving lower overall profits if too low a price point is established. The skimming and penetration alternatives, and combinations thereof, give rise to profit streams that differ not only in magnitude but also in their time pattern. The problem becomes further complicated when we consider the constraint imposed on such optimal pricing and advertising policy by the behavior of potential rivals entering the market and affecting the firm's share of the market.

In the B2B setting, some joint price–advertising decisions, resembling the simple penetration versus skim alternatives described above, are frequently made for strategic purposes. It should be noted here that in B2B practice, especially in the manufacturer-to-distributor transaction, the advertising budget may include expenses for other support activities as well: customer service, or technical support, for example, or even holding inventory for the distributor. All of these support activities improve the quality of service offered by the distributor to its own customers, and/or reduce the distributor's cost. In this paper, it is understood that the term "advertising budget" may include these support activity expenses.

One pricing–advertising strategy couples a low penetration price with an extensive advertising budget. This would be adopted by the manufacturer whose goal is to keep potential competitors out, or to gain market share by pushing out competing suppliers, for example by a pharmaceutical manufacturer seeking to boost share via horizontal market entry. While some of the manufacturer's margins are sacrificed using this strategy, certain key accounts may be targeted for penetration. Successful adoption in these accounts can furthermore have testimonial value: other potential accounts may be more likely to adopt as well give the news of the adoption at the key account. As an alternative, manufacturers may choose a version of the skimming strategy in which a very high price is supported by high advertising outlay. Here, the manufacturer is competing by offering high customer value. In the hospital supply business, some suppliers, such as McKesson-Robbins, couple a high price point with extensive customer support and inventory maintenance (the distributor may never actually take possession of the goods, as McKesson-Robbins incurs all of the warehousing costs). This strategy might be more applicable when switching costs are high, such as in data storage devices or servers in the computer equipment market. A negative of such a strategy is that the customer value supplier will be undercut on price by market-share-building suppliers. But, by avoiding price cuts to match the lower end supplier, the customer value supplier never has to face the difficult prospect of raising its price at a later time.

In this paper we seek to establish theoretical conditions for optimal pricing and advertising policy using a dynamic model. We provide important insights into (1) the behavior of B2B firms developing strategy for new product introduction while facing the threat of potential entry, (2) the differential behavior of the large and small firm in the oligopolistic framework, and (3) the changes in the firm's behavior associated with the life cycle of the products. The insights provided here should contribute to improving strategy for corporate profit maximization.

In Section 1 of this paper, we develop the essentials of the model to be subsequently used in the optimization procedure. The focus is on analyzing the time path of the firm's market share initially when the product is introduced, and subsequently when the competitors have entered the market. In Section 2, the optimization procedure is carried out and the final conditions for profit maximization are established. Some interesting conclusions regarding the differential price and advertising behaviors