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Which business model for e-book pricing?☆

Danilo C. Dantas[a], Sihem Taboubi[b], Georges Zaccour[c,*]

[a] Marketing Department, HEC Montréal, Canada
[b] Marketing Department, HEC Montréal and GERAD, Canada
[c] Chair in Game Theory and Management, HEC Montréal and GERAD, Canada

HIGHLIGHTS

- We study revenue-sharing and wholesale-pricing contracts in a distribution channel.
- We show that a revenue-sharing contract is profit improving with respect to the wholesale-price contract.
- It also leads to lower prices and consumer would vote for a revenue-sharing contract.
- The analysis is inspired by pricing of e-books.

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ABSTRACT

We characterize and compare equilibrium pricing strategies in a marketing channel in two scenarios. In the first scenario, the manufacturer chooses the wholesale prices of the two versions of a product, i.e., tangible and digital. and the retailer their prices to consumer. In the second scenario, the players use a revenue-sharing contract for only the digital version, while the competing version is managed by a wholesale price contract. The problem is inspired from a pricing controversy in the e-book industry.

1. Introduction

We consider a distribution channel where a supplier sells its product through an exclusive retailer. The product is available in two partially substitutable formats *e* and *h*. To illustrate this idea, think of *e* as an *e*-book, and *h* as a hard copy. Suppose that two business models can be envisioned: (i) a standard model where the supplier chooses the wholesale prices of *e* and *h*, and the retailer their price to consumers; and (ii) a revenue-sharing contract (RSC) where the supplier fixes the retail price of product *e* and the wholesale price of product *h*, and the retailer determines the retail price of product *h*. We address the following questions:

1. How do wholesale and retail prices compare under the two scenarios?
2. Under what conditions is an RSC implementable?
3. What would a fair sharing rule be?
4. Which business model consumers prefer?

Our motivation for studying this problem is the conflict over *e*-book pricing between Macmillan (a publisher) and one of the largest retailers (Amazon). In a dramatic move, in January 2010 Amazon removed the buy button from all Macmillan books in its *e*-library because the two companies could not agree on *e*-book pricing. The conflict started when Macmillan wanted to change

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* Correspondence to: GERAD, HEC Montréal, 3000 Côte-Sainte-Catherine, Montréal, Canada, H3T 2A7. Tel.: +1 514 340 605x6050; fax: +1 514 340 5665.
E-mail address: georges.zaccour@gerad.ca (G. Zaccour).

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the wholesale-pricing contract with a revenue-sharing contract (agency model), which would allow greater control on retail prices. Initially, Macmillan's *e*-book wholesale price was 50% of the hardcover price, and Amazon was free to set the *e*-book price and it did it at a maximum level of $9.95. Amazon offered the *e*-book at a price below cost, with the objective of stimulating the sales of its Kindle device.[1] To force Amazon to increase the *e*-book price, because its loss-leader pricing strategy had a cannibalizing effect on hardcover books, Macmillan wanted to impose an RSC, with suggested retail prices between $12.99 and $15.99, and a revenue-sharing rule that would give the distributor 30% of revenues and the publisher 70%. Also, Macmillan informed Amazon that it would enforce a delay between the publication of the paper and Kindle versions if Amazon continued its low pricing practice.

According to some business analysts,[2] giving publishers' control of pricing decisions would allow them to increase retail prices, while others argue that competition would prevent this. In April 2010, Apple launched its iPad, inducing competition in the reading-device market, and Macmillan implemented an RSC with Apple (30% of revenues for Apple).

It is known that when one independent firm in a distribution channel ignores its price's impact on the other channel member, channel profit is lower than it would be in the opposite situation. The core problem is that each firm sets its price above its own marginal cost, so every channel member has a positive margin. This double marginalization (DM) causes the retail price to be too high to maximize channel profit. To deal with the DM problem, a series of coordinating mechanisms have been proposed: (i) quantity discounts and two-part tariffs (see Ingene et al., 2012 for a review); (ii) revenue-sharing contracts (Cachon, 2003; Cachon and Lariviere, 2005); (iii) cooperative advertising programs, where a supplier pays part of retailer's advertising expenses for promoting the supplier's brand (see the review in Jørgensen and Zaccour, 2014); and (iv) other mechanisms, e.g., leadership, promotions, buy-back contracts and price discounts.

In a revenue-sharing contract, the revenues are generated by the retailer, who then transfers part of them to the supplier, using a lump-sum payment or a per-unit wholesale price. Two observations can be made. First, one can design an RSC that coordinates the supply chain, and ex-post select the sharing parameter. Second, as in quantity-discount and two-part tariff contracts, an RSC limits the wholesale price, and consequently the retail price, to a value that maximizes the chain's total profit. This means that it solves the DM problem (Mortimer, 2008), and firms can expect substantial benefits from an RSC (Cachon, 2003).

To the best of our knowledge, no paper has dealt with our context with two competing formats, and only one contains the possibility of management through a revenue-sharing contract. Our setting, which is motivated by the book industry, could be generalized to many other contexts, e.g., any product offered in a digital format using a platform provider such as Amazon, Apple or eBay. Further, the type of conflict we described was also experienced by the music industry, when Apple launched its iTune Store. The movie and the video-game industries are also candidates for such conflicts, as digital formats are replacing physical ones, and traditional channels are disappearing to the benefit of online retailers.

2. Model

Consider a distribution channel where a supplier (player *M* for Macmillan) sells his product through a retailer (player *A* for Amazon). The product comes in two formats, namely, *e* and *h*. Denote by P_i the retail price of product $i \in \{e, h\}$, and let the demand system be given by

$$Q_e(P_e, P_h) = \alpha_e - \beta_e P_e + \gamma P_h, \tag{1}$$

$$Q_h(P_e, P_h) = \alpha_h - \beta_h P_h + \gamma P_e, \tag{2}$$

where α_i is the market potential of $i \in \{e, h\}$, and β_i and γ are positive parameters capturing the effects of prices on demands. Suppose that $\beta_i > \gamma, i \in \{e, h\}$, which means that the own-price effect is larger than the cross-price effect.

Denote by w_i the transfer price of product $i \in \{e, h\}$. To keep it simple, assume that production and handling costs are zero. This assumption is by no means restrictive, as positive costs will simply shift the quantitative results up or down, without any qualitative loss. Denote by π_M and π_A the profits of *M* and *A*, respectively.

We characterize and compare the equilibrium results in two scenarios:

Wholesale pricing: the retailer chooses the retail prices of both products, and the supplier the transfer prices. We superscript the variables by *WP* in this scenario. The players' optimization problems are as follows:

$$\begin{aligned}\max_{w_e, w_h} \pi_M^{WP} &= w_e(\alpha_e - \beta_e P_e + \gamma P_h) \\ &\quad + w_h(\alpha_h - \beta_h P_h + \gamma P_e), \end{aligned} \tag{3}$$

$$\begin{aligned}\max_{P_e, P_h} \pi_A^{WP} &= (P_e - w_e)(\alpha_e - \beta_e P_e + \gamma P_h) \\ &\quad + (P_h - w_h)(\alpha_h - \beta_h P_h + \gamma P_e). \end{aligned} \tag{4}$$

Revenue sharing: the supplier controls the *e*-book retail price and the paper book's transfer price, while the retailer controls the paper book's retail price. In this revenue-sharing scenario (*RS*), the players share *e*-book revenues, with the supplier getting S, $0 < S < 1$, and the retailer, $1 - S$. The players' optimization problems are as follows:

$$\begin{aligned}\max_{P_e, w_h} \pi_M^{RS} &= (1 - S) P_e(\alpha_e - \beta_e P_e + \gamma P_h) \\ &\quad + w_h(\alpha_h - \beta_h P_h + \gamma P_e), \end{aligned} \tag{5}$$

$$\begin{aligned}\max_{P_h} \pi_A^{RS} &= S P_e(\alpha_e - \beta_e P_e + \gamma P_h) \\ &\quad + (P_h - w_h)(\alpha_h - \beta_h P_h + \gamma P_e). \end{aligned} \tag{6}$$

We assume that the players determine their pricing strategies noncooperatively, and that the game is played à la Stackelberg, with the supplier being the leader, and the retailer, the follower. To determine a Stackelberg equilibrium, we first derive the reaction function of the retailer, and next optimize for the manufacturer.

We investigate under what conditions the *RS* business model is Pareto improving with respect to the *WP* business model. If such conditions yield a nonempty interval in terms of S, we then conclude that the *RS* model is implementable (or feasible), i.e., it meets both players' participation constraints. The next step would be to select a value of S. Although any result in the feasible interval for S could be justified on some grounds, we propose to apply the egalitarian principle and to share equally the dividend produced by the *RS* model with respect to the *WP* business model.

3. Equilibria

We characterize in this section the Stackelberg equilibria for the two retained scenarios.

[1] Source: http://publishingtrendsetter.com/industryinsight/simple-explanation-agency-model/. Last visited May 15, 2014.

[2] *Business Week*, February 2, 2010.