SALES INCENTIVES IN DISTRIBUTION CHANNELS: THE EFFECTS OF RETAILER’S PRICING SCHEME AND COMPETITION

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ABSTRACT

We analyze the effectiveness of sales incentives in multi-stage distribution channels where the retailer implements uniform pricing or price discrimination. Different forms of incentives by the manufacturers are analyzed such as threshold-controlled lump sum incentives and per-unit incentives, and coordination issues are discussed. In addition to the incentives given to the retailers, we analyze incentives directed to the customers, i.e., customer rebates. Incorporating the effect of competition, we also provide insights on the choice of promotion type by competing manufacturers.

Keywords: Retailer incentives, customer rebates, price discrimination, competition, automotive industry

INTRODUCTION

Many organizations are positioned in multi-stage distribution channels where they utilize retailers to sell their products to the end customers. This structure leads to indirect sales by manufacturers or wholesalers and allows different options for promoting their products. For example, a manufacturer may offer a sales incentive directly to the end customer in the form of a customer rebate, or may offer an incentive to its immediate customer (e.g., the retailer) in the form of a retailer incentive, both with the hopes of stimulating customer demand. In addition to the different choices of audience for directing the promotion, the manufacturer also has the flexibility to choose a particular structure for the promotion. For example, retailer incentives may sometimes be offered based on the size of the retailer’s order quantity; in other cases there may be no strings attached to the promotion.

From the manufacturer’s point of view, it is essential to know whether the promotions are effective in achieving the ultimate goal of improving sales and profits, and whether one particular form of promotion is superior to the others under certain conditions. Some important factors that influence the effectiveness of sales incentives are the retailer’s pricing mechanisms and the existence of competition.

Motivated from the practices of automotive manufacturers in the United States domestic market, we investigate the effects of sales incentives on manufacturers’ profits. In this industry, promotions are frequently offered, which may be given directly to customers or given to retailers (dealers) to increase demand. Retailer incentives can take different forms, e.g., lump-sum, per-unit, or quote-based incentives. One distinct characteristic of the retailers in this industry is that they are able to perform price discrimination (to some
extent) due the nature of negotiation-based sales. Thus, it is interesting to investigate price-discriminating retailer as well as a uniform-price charging retailer. Competition is also an important component of the industry that may affect the companies’ promotion decisions.

In our research, we investigate the performance of different sales incentives by incorporating issues such as price discrimination and competition. First, we analyze a single-manufacturer single-retailer channel and focus on retailer incentives that differ in terms of their dependence on the retailer’s order quantity. In particular, we consider a (quantity-based) per-unit incentive and a (non-quantity based) lump-sum incentive scheme, where the retailer receives an incentive for each unit ordered in the former and a bonus payment independent of the order quantity in the latter. We analyze quantity-based incentive schemes where the retailer is qualified to receive a per-unit incentive (wholesale price discount) or a lump-sum payment only when the order quantity exceeds a threshold, the value of which is determined by the manufacturer. We consider two pricing strategies by the retailer. In one setting, the retailer charges a uniform price for each unit sold; in another setting, the retailer is equipped with the ability to exercise first-degree (perfect) price discrimination and may charge varying prices for each unit sold.

Next, we analyze the case with two competing supply chains. We assume that the retailer is willing to sell a unit only if the selling price is above a certain value, which we refer as the retailer’s reservation price. We study a single-period model where the manufacturer initiates the interactions by declaring the wholesale price and promotion amount and the retailer determines the order quantity. We use a downward-sloping linear demand function. We model the choice of promotion as an exogenous decision, hence we assume that the manufacturer commits to a certain type of promotion before engaging business relations with the retailer. We compare the manufacturer’s profits under different incentives and also consider issues such as whether channel coordination is achieved with the use of incentives. In the case of competition, the manufacturers act simultaneously to determine their wholesale prices and promotion amounts, who are followed by retailers acting simultaneously to make their order quantity decisions. We model problems in a game theoretical framework and obtain insights using the Nash equilibrium decisions.

Marketing, economics and more recently the operations management literature have investigated the sales promotions and their roles on firms’ profitability. Gerstner and Hess [6a] and Narasimhan [7], focus on the use of rebates in achieving price discrimination when there is no intermediary in the supply chain, and Gerstner and Hess [6b] introduce channel issues by into the analysis of the sales promotions. Bruce et al. [3a, 3b] analyze trade promotions (wholesale price discounts after a sales quantity target is met) and cash rebates by explicitly incorporating a durability measure for the manufacturer's products. There is a large amount of empirical research investigating how promotions work, focusing mostly on non-durables. See Blattberg et al. [2] for a review. In the operations area, Aydin and Porteus [1] and Chen et al. [5] are some examples of research in this direction. The first article compares rebates given to the customers and rebates given to the retailers modeling a stochastic demand. The latter focuses on the customer rebates and they show that they are effective in increasing the manufacturer’s profits only when some customers fail to redeem their rebates.
Most relevant work is by Caliskan Demirag et al. [4], where the authors compare customer rebates and retailer incentives when the retailer can price discriminate. However, they do not consider threshold-based retailer incentives, which we include in our analysis. Different from their work, we also give insights on which of the two promotions, i.e., customer rebates and retailer incentives would work better for a manufacturer that is in competition with another manufacturer who also sells its products through a retailer.

**MODELS**

We present our model with threshold-controlled retailer incentives where the retailer is able to implement first-degree price discrimination. We model the setting as a two-stage distribution channel with a manufacturer and a retailer. The manufacturer determines the wholesale price \( w \), and announces the type of retailer incentive along with the incentive value \( K \) (lump-sum amount) or \( k \) (per-unit amount), and threshold order quantity \( (T) \). The retailer then decides the order quantity, which we denote with \( Q \). Table 1 summarizes the notation.

<table>
<thead>
<tr>
<th>Notation</th>
<th>Description</th>
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<tbody>
<tr>
<td>( a )</td>
<td>Market potential</td>
</tr>
<tr>
<td>( b )</td>
<td>Price sensitivity of customers</td>
</tr>
<tr>
<td>( P(Q) )</td>
<td>Retail price when ( Q ) units are sold, i.e., ( P(Q) = a - bQ )</td>
</tr>
<tr>
<td>( \Pi^M )</td>
<td>Profit of the manufacturer</td>
</tr>
<tr>
<td>( c )</td>
<td>Production cost of the manufacturer</td>
</tr>
<tr>
<td>( w )</td>
<td>Wholesale price</td>
</tr>
<tr>
<td>( w + m )</td>
<td>Reservation price of the retailer</td>
</tr>
<tr>
<td>( K )</td>
<td>Lump sum incentive given to the retailer</td>
</tr>
<tr>
<td>( k )</td>
<td>Per-unit incentive given to the retailer</td>
</tr>
<tr>
<td>( T )</td>
<td>Threshold order quantity after which the retailer receives an incentive</td>
</tr>
<tr>
<td>( r )</td>
<td>Retailer’s per-unit price when uniform pricing is used</td>
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</tbody>
</table>

Due to the sequential decisions by the channel members, we solve for the players’ equilibrium decisions using a backward induction procedure. We start with the retailer’s problem when the manufacturer offers a threshold-controlled lump-sum incentive. The formulation is as follows. Given the manufacturer's decisions \( w, K \), and \( T \), the retailer solves the problems in (1) (where \( 0 \leq Q \leq T \)) and (2) (where \( Q > T \)), and selects the order quantity that brings higher profit.

\[
\begin{align*}
\max_{0 \leq Q \leq T} & \int_0^Q (a - bq) dq - wQ \\
\text{s.t.} & \quad Q \leq \frac{a-w-m}{b}
\end{align*}
\]  

(1)
Then, we can show that the retailer is always better off by ordering at least T units, where his best response to the manufacturer's decisions is as follows:

\[
Q^*(w, K, T) = \max \left\{ T, \min \left\{ \frac{a-w}{b}, \frac{a-w-m+\sqrt{2Kb}}{b} \right\} \right\}.
\]  

Anticipating the retailer's best response, the manufacturer solves the following problem:

\[
\begin{align*}
\max_{w \geq m} & \quad (w - c)Q^*(w, K, T) - K \\
\text{s.t.} & \quad c \leq w \leq a - m \\
& \quad \frac{(a - w - m - bT)^2}{2b} \leq K \\
& \quad T \geq \frac{a-w-m}{2b}
\end{align*}
\]  

Optimizing the manufacturer’s problem in (4), we obtain the manufacturer’s best response. We summarize the equilibrium decisions in Proposition 1.

\textbf{Proposition 1}: When the manufacturer offers a lump-sum incentive to a perfectly price discriminating retailer for exceeding a threshold order quantity, the equilibrium is as follows: \(w^* = a - m, K^* = \frac{(a-m-c)^2}{2b}, T^* = \frac{a-m-c}{b}, Q^* = \frac{a-m-c}{b}, \) and \(\Pi^M = \frac{(a-m-c)^2}{2b}\).

In the case with uniform pricing, the retailer chooses the per-unit retail price \((r)\) to charge from every buyer. Continuing with the threshold-controlled lump-sum incentive, we formulate the retailer’s problem as follows. The retailer solves the problems in (5) and (6), and selects the retail price that brings higher profit.

\[
\begin{align*}
\max_{r \geq \max\{w+m, a-bT\}} & \quad (r - w) \left( \frac{a-r}{b} \right) \\
\max & \quad (r - w) \left( \frac{a-r}{b} \right) + K \\
\text{s.t.} & \quad (w + m - r)^+ \left( \frac{a-r}{b} \right) \leq K \\
& \quad r \leq a - bT
\end{align*}
\]  

We can show that the retailer always finds it more profitable to use the incentive when provided. Let the retailer's best response be \(r^*(w, K, T)\). Then, the manufacturer solves the following problem:
We summarize the equilibrium results in Proposition 2.

**Proposition 2:** When the manufacturer offers a lump-sum incentive to a uniform-price-charging retailer for exceeding a threshold order quantity, the equilibrium is as follows:

\[
\begin{align*}
\max & \quad (w - c) \left( \frac{a-r^*(w,K,T)}{b} \right) - K \\
\text{s.t.} & \quad c \leq w \leq a - m \\
& \quad (w + m - (a - bT))T \leq K
\end{align*}
\]  

(7)

The procedure for finding the equilibrium decisions when the manufacturer offers a per-unit incentive after the retailer’s order quantity achieves a threshold level follows similar steps to those shown above, hence they are omitted from this paper. We state our results for both forms of retailer incentives in Proposition 3. (For completeness we also list the previous findings by Caliskan Demirag et al. [4], where threshold-controlled incentives are not considered.)

**Proposition 3:** When the retailer exercises first-degree price discrimination,

(i) (Caliskan Demirag et al. [4]) both the lump-sum incentive and the per-unit incentive improves the manufacturer’s profits,

(ii) the incentives further increase the manufacturer’s profit when they are offered after the order quantity exceeds a threshold level. In this case, the equilibrium outcome brings the centralized channel profit, hence coordination is achieved.

When the retailer charges uniform price from all customers,

(i) (Caliskan Demirag et al. [4]) neither of the incentives improves the manufacturer’s profit.

(ii) the incentives are able to increase the manufacturer’s profit when they are offered after the order quantity exceeds a threshold level, but they are not able to achieve coordination in the channel.

In the case with competition, our focus is on comparing the retailer incentives and customer rebates. We model retailer incentive as lump-sum payments from the manufacturer to the retailer and rebates as per-unit payments from the manufacturer to the customer. The members of the supply chains interact as follows. The manufacturers move first and simultaneously make their wholesale price and promotion decisions. Next, the retailers observe the manufacturers’ decisions and simultaneously make their order quantity decisions. Omitting the technical details in the analysis, we directly state our findings in Observation 1.

**Observation 1:** In the benchmark case with no promotions, we characterize the equilibria explicitly and identify the market conditions for a unique equilibrium to exist. We find that retailer incentives can be used by manufacturers to simultaneously improve each of their profits, but the retailers may have reduced profits as a result of the retailer incentive promotion. When manufacturers use customer rebates, we show that a manufacturer may be able to decrease the profit of her competitor while increasing her own profit, although
she is also at risk for her competitor to use rebates similarly. We also observe from numerical examples that a manufacturer responds to the competitor’s promotion with the identical promotion, except when the manufacturer has high production cost and sells to customers with high price sensitivity, in which case responding to the competitor's retailer incentive with a customer rebate can be more profitable.

CONCLUSION

Sales incentives are important promotional tools for organizations, which warrants the need for research investigating their effectiveness under different settings and scenarios. Focusing on promotions from the manufacturers to the retailers or customers and incorporating the considerations such as retailer’s different pricing schemes as well as competition in multiple channels, we analyzed the effectiveness of the sales incentives on the manufacturers’ profits and channel coordination. We further provided insights on the manufacturer’s optimal choice of promotions in the presence of competition.

REFERENCES


