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Eitan Gerstner; James D. Hess

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A Theory of Channel Price Promotions

By EITAN GERSTNER AND JAMES D. HESS*

Manufacturers can stimulate sales by a temporary wholesale price reduction for the retailer, a rebate directed toward consumers, or a combination of both. The trade-offs between these price promotions are analyzed, providing insights about their roles, profitability, and welfare properties. Retailers' rebates are also studied. While price discrimination is a common explanation for rebates to consumers, when a product is sold through a distribution channel, the manufacturer may also use rebates to motivate retail participation in the promotion. This explains why rebates may be offered even when all consumers use them and price discrimination does not occur. (*JEL* M31)

Price promotions are special low-price offers initiated by manufacturers or distributors to stimulate demand. Manufacturers who sell a product through a distributor (a channel of distribution) can direct price promotions to distributors or to end users. The first type of price promotion is called a "push" by marketers and the second a "pull." An example of push price promotion is a temporary wholesale price reduction (called a trade deal), and examples of pull price promotions are manufacturer coupons and rebates. Periodic sales and store coupons illustrate retailer price promotions.

Retailer and manufacturer price promotions are interrelated. Push price promotions will not stimulate demand if stores do not cooperate by passing through the trade deal (Randolph Bucklin and James Lattin, 1989; Rajiv Lal, 1990), and pull price promotions will not increase demand if the stores counteract direct discounts from manufacturers to customers by raising the retail price (William Levedahl, 1984). How do manufacturers motivate retailers to participate in their price promotions? Why are cents-off coupons and rebates so popular with manufacturers and retailers despite their high distribution and processing costs (William Keenan, 1989)? Will consumers and the economy be better off under push? Finding answers to these questions is of great importance because billions of dollars are spent each year on price promotions. (According to the Manufacturer Coupon Control Center, consumers used coupons valued at $2.93 billion in 1988.) Consumers spend countless hours searching for price promotions and redeeming coupons and rebates.

Previous research has analyzed price promotions in a framework of one or more sellers who sell directly to end users. The main purpose of these studies was to rationalize why sellers vary their prices even when demand and supply conditions are stable. Many researchers have focused on price discrimination, setting aside the channel issues just mentioned. Markets can be segmented, for example, based on consumer heterogeneity in willingness to pay and information and transaction costs (Hal Varian, 1980; Chakravarthi Narasimhan, 1984; Gerstner and Duncan Holthausen, 1986) or intertemporal price expectations (John Conlisk et al., 1984; Abel Jeuland and Narasimhan, 1985; Gerstner, 1986; Edward Lazear, 1986; B. Peter Pashigian, 1988). The

*Gerstner: Department of Business Management, North Carolina State University, Raleigh, NC 27695-8110, and Department of Economics, University of Haifa, Haifa, Israel; Hess: Department of Business Management, North Carolina State University. We thank Duncan Holthausen for his help in formulating the problems investigated in this paper and Sridhar Moorthy for his useful comments and insight.

sellers exploit the ill-informed, high-transaction-costs, or impatient customers by charging them a higher price.

Price discrimination is not the only reason for price promotions. For example, Hess and Gerstner (1987) and Rockney Walters (1988) studied retail price promotions designed to build store traffic. Customers attracted by low-priced "loss leader" items also buy complementary products with large retail markups, as stores have monopoly power once customers are at the store because of high search costs. Gerstner and Hess (1990) investigated purchases of substitute products by customers attracted by advertised but understocked low-priced brands, a practice known as bait and switch. Although channel issues are involved in these price-promotion strategies, they have not been explored. For example, some manufacturers object when their products are used as loss leaders, because they fear that their products' images might be damaged.

None of these studies considers channel issues. This is surprising because there is empirical evidence that retailers often do not pass trade deals on to consumers, and when they do, only a fraction of the trade deal is passed through (Ronald Curhan and Robert Kopp, 1986; Kenneth Hardy, 1986; Robert Buzzell et al., 1990). Furthermore, retailers seem to respond to coupons by raising their shelf prices (Levedahl, 1984; Naufel Vilcassim and Dick Wittink, 1987).

In contrast to the papers above, price promotions are analyzed here in a channel framework, explicitly considering push versus pull trade-offs. We investigate four types of price promotions: trade deals only, manufacturer rebates only, a combination of both, and retail rebates. It is shown that these promotions are less likely to occur within a channel of distribution, because the manufacturer must sacrifice profits in order to motivate retail cooperation. Rebates can be more profitable than trade deals for the manufacturer even when *all* customers take advantage of the promotion and price discrimination does not occur. A manufacturer who uses rebates together with trade deals further improves his profits through price discrimination without reducing those of the retailer. The retailer prefers trade deals to manufacturer rebates, but if the manufacturer does not offer rebates, the retailer will. These and other managerial and policy-oriented results are derived using a simple model, which is presented next.

I. The Model

Consider a channel of distribution with a monopolist manufacturer who sells a product exclusively through a single, independent retailer to two consumer segments (this is called a conventional exclusive-distribution channel). One segment consists of customers willing to pay a high price, and the other consists of customers willing to pay only a low price. The two segments will be referred to as "highs" and "lows," respectively, for the remainder of the paper. The manufacturer produces a homogeneous product at a constant unit cost, assumed for simplicity to be zero. Costs of manufacturing, retailing, and processing of push and pull promotions are all irrelevant for the arguments made below, so they are assumed for simplicity to be zero. Since costs are zero, all consumers ought to be sold the product in an efficient market, but this may not occur in this monopolized market. The product is sold to the retailer at a wholesale price P_w, and the retailer resells the product at a retail price P_r.

The highs place a reservation price, V_H, on the product, and lows have a reservation price V_L, where $0 < V_L < V_H$. It is convenient to normalize the size of the market to 1.0. Let α be the segment size of highs and let $1 - \alpha$ be the segment size of the lows.

It is assumed that the manufacturer historically had sold only to the highs and that recently there has been an increase in the number of lows or in their willingness to pay sufficiently large so that the manufacturer can earn higher profit from retail sales to all consumers. Demand is price-elastic only in the sense that if price is reduced the low segment will buy the product. To keep things simple, the dynamics of this market are not addressed (see Conlisk et al. [1984] for a

model in which accumulation of low-value consumers induces a monopolist to hold periodic sales). The manufacturer can motivate the retailer to sell to the lows by giving him a trade deal (pushing the product), by offering a rebate or coupon directly to consumers (pulling the product), or by doing both. D and R denote the values of the trade deal and rebate or coupon, respectively.

The manufacturer cannot separate the market segments, and therefore the rebates or coupons are offered to all consumers. Each consumer self-selects whether or not to use the rebate depending on redemption costs (time and effort involved in processing the rebates or coupons). The redemption costs of the segments are assumed to be positively associated with their willingness to pay, as will be discussed in Section III. The distinction between a coupon, which is a certificate that gives an immediate price reduction upon purchase of the product, and a rebate, which is a refund sent to the buyer after the purchase, is immaterial if consumer redemption costs are identical. Here, "rebate" is used interchangeably for "rebate or coupon" to improve readability.

The retailer takes the wholesale price and rebate as given when deciding on the retail price. He is said to participate in the manufacturer's price promotion if the retail price leads all the customers in the market to buy the product. The retailer opposes the price promotion if the retail price is set so that only highs will buy. Acting as a channel leader, the manufacturer takes the retailer's reaction into account when deciding on optimal price-promotion policy. In the following sections, we derive and compare channel members' profits under different promotion strategies.

II. Pure Push Price Promotions

Pure push promotions ("push" for short) involve wholesale price reductions called trade deals; manufacturer rebates are not offered. If the retailer refuses to participate in the promotion, he charges the reservation price of the highs, V_H, and the lows do not buy the product. In this case, the manufacturer profit-maximizing wholesale price is $P_w = V_H$, and the retailer earns zero profits (because retailing costs are zero).

To motivate the retailer to sell to all the consumers, the trade deal must induce a retailer price no higher than V_L; otherwise lows will not buy the product. Calling V_H the "regular price" and V_L the "sale price," the intensity of push will be measured by the trade deal, $D = V_H - P_w$. What is the smallest trade deal that motivates a retail sale?

For a given wholesale price, the retailer's profit from selling at the regular price to highs only is $\alpha(V_H - P_w)$. The profits from selling to all customers is $V_L - P_w$. The wholesale price will be adjusted until the retailer is just indifferent between the two options. Set the two retail profit expressions equal and solve for the optimal trade deal:

$$(1)\quad D^*(\text{push}) = V_H - P_w^*(\text{push}) = (V_H - V_L)/(1-\alpha).$$

Note that the trade deal that motivates the retailer to hold a sale is larger than the retail sale, $V_H - V_L$. This is consistent with the empirical evidence cited above that the retailer only passes a fraction of the trade deal on to consumers.

The resulting optimal profits of manufacturer and retailer are

$$(2)\quad \pi_m(\text{push}) = P_w^*(\text{push}) = (V_L - \alpha V_H)/(1-\alpha)$$

$$(3)\quad \pi_r(\text{push}) = V_L - P_w^*(\text{push}) = \alpha(V_H - V_L)/(1-\alpha).$$

Total channel profit is V_L under push.

The manufacturer prefers a push price promotion to leaving the wholesale price at the regular price when

$$(4)\qquad V_L \geq \alpha V_H(2-\alpha).$$

While it is not always the case that a price promotion is justified, the only interesting situation is when a new consumer segment

is big and profitable enough to justify a "sale." This condition will be assumed to hold throughout the remainder of the paper.

III. Pure Pull Price Promotions

Pure pull price promotions ("pull" for short) involve manufacturer rebates but no trade deals. With no trade deal, the wholesale price, P_w(pull), equals the regular price, V_H. Pure pull may be attractive when wholesale price reductions irritate retailers who recently have bought at the regular price for their inventory or when it is costly to change wholesale price catalogs. Pull also has another advantage, as we will show next. The combination of push and pull is analyzed in Section V.

Consumers will use a rebate if its dollar value exceeds redemption costs. When a rebate is more attractive to the low segment than to the regular high customers, it can be used to increase the profits of the manufacturer. Recall that the manufacturer is trying to bring the lows into the market. In general, it will be assumed that the lows have smaller costs of using the rebate than the highs, but to keep notation at a minimum, we specifically assume that the redemption costs of the highs, T, are positive, whereas the redemption costs of the lows are zero. This implies that there is a positive association between willingness to pay and redemption costs.

The rebate is said to be "large" if all consumers use it. When the redemption costs of the highs are larger than the rebate, the rebate is said to be "small," and price discrimination occurs, as will be shown below. Assume for the remainder of this section that all the highs and lows use the rebate because it is "large" relative to their redemption costs. The case of small rebates will be addressed in Section IV. When a rebate R is offered, highs are willing to pay a retail price up to $V_H - T + R$ and obtain a surplus of $V_H - T + R - P_r$, whereas lows obtain a surplus of $V_L + R - P_r$.

For a given rebate value, R, the exclusive retailer faces two alternatives: participate in the pull price promotion by setting the retail price so that the lows buy the product using the rebate, or oppose the pull by raising the retail price above the reach of lows. How will the rebate be determined, given the need to motivate retail participation?

When the retailer participates in the pull promotion and sells to all consumers, retail profit is maximized by reducing the retail price until the surplus of the lows is zero. The retail price under participation is $V_L + R$, and retail profit equals $(V_L + R) - V_H$. On the other hand, if the retailer opposes the pull price promotion, intending to sell only to the highs, he maximizes profits by raising the retail price until highs obtain no surplus. The retail price under nonparticipation is $V_H - T + R$, and retail profit equals $\alpha[(V_H - T + R) - V_H] = \alpha(R - T)$, recalling that wholesale price equals the regular price.

To induce retail participation, the profit-maximizing manufacturer adjusts the rebate until the retailer is just indifferent between participating or not. Set the two retail profit expressions equal and solve for R:

$$(5) \quad R^*(\text{pull}) = (V_H - V_L - \alpha T)/(1-\alpha).$$

The corresponding retail price is

$$(6) \quad P_r^*(\text{pull}) = V_L + R^*(\text{pull}) = V_H + \alpha(V_H - T - V_L)/(1-\alpha).$$

Since the wholesale price equals the regular price, the retail price cannot be below regular price V_H, or the retailer would lose money. The condition

$$(7) \quad T < V_H - V_L$$

guarantees that the retail price is above the regular price when rebates are offered. This is consistent with the empirical evidence cited above that retailers respond to rebates by raising their prices.

Condition (7) also implies that all highs use the large rebate and obtain positive

surplus. When (7) does not hold, price discrimination with small rebates will occur, as will be discussed below.

The optimal profits of the manufacturer and retailer under pull are

$$(8)\quad \pi_m(\text{pull}) = V_H - R^*(\text{pull}) = \pi_m(\text{push}) + \alpha T/(1-\alpha)$$

$$(9)\quad \pi_r(\text{pull}) = V_L + R^*(\text{pull}) - V_H = \pi_r(\text{push}) - \alpha T/(1-\alpha).$$

Total channel profits equal the lows' willingness to pay, V_L.

Even if all consumers use rebates, the manufacturer prefers a pull price promotion to no promotion when

$$(10)\qquad V_L \geq \alpha V_H(2-\alpha) - \alpha T.$$

Since we have previously assumed that condition (4) holds throughout, condition (10) must also be true.

IV. Comparing Pure Push and Pure Pull

Manufacturer.—From equation (8), we see that the manufacturer's profits under pull exceed his profits under push if

$$(11)\qquad T > 0.$$

Since this was assumed in order to create a positive association of willingness to pay and redemption costs, we have the following result.

Result A: The manufacturer prefers rebates to trade deals in a conventional exclusive channel even when all the consumers use the rebate.

How can large rebates be more profitable for the manufacturer than trade deals, even when all consumers use the rebates and no price discrimination occurs?

Without a price promotion the manufacturer sets the wholesale price equal to the regular price V_H, and the best the retailer can do is to sell to the highs at the regular price, earning a zero profit. Since condition (4) holds, the manufacturer finds it profitable to push with a deep trade deal of $V_H - P_w^*(\text{push})$ to motivate retail participation. A wholesale price reduction from V_H to V_L will not suffice because the retailer earns zero profit from selling to all customers at V_L. The retailer can earn positive profits by not passing through the trade deal, selling only to the highs at V_H while paying V_L wholesale. Because of this credible threat, the manufacturer must push harder, and the optimal trade deal will be significantly larger than $V_H - V_L$.

Under pure pull, a rebate is offered directly to customers, and no trade deal is offered to the retailer (the wholesale price remains V_H). The rebate, however, motivates retail cooperation because the resulting retail price, $V_L + R^*$, is sufficiently above the wholesale price, V_H. At the same time, the rebate limits the retailer's threat of nonparticipation because highs incur transaction costs when using the rebate. The larger is the highs' redemption cost, the less likely they are to use rebates, so the retailer's threat to raise the price above the regular price is less viable. With rebates, the highest price the highs will pay is $V_H - T + R^*$, and charging this price instead of $V_L + R^*$ under participation allows the retailer to threaten to add revenue per customer of only $V_H - T - V_L$, compared to $V_H - V_L$ with trade deals.

A different way to see why the manufacturer prefers pull to push is as follows. Under push, the differential in willingness to pay between the two segments is $V_H - V_L$, and under pull it is reduced to $V_H - T - V_L$. With a lower difference in willingness to pay, the demand the retailer faces is more elastic, so the rebate required to motivate retail participation is less than the deep trade deal needed under push. Comparing equations (1) and (5) gives

$$(12)\quad R^*(\text{pull}) = D^*(\text{push}) - \alpha T/(1-\alpha)$$

which may be stated in words as the following result.

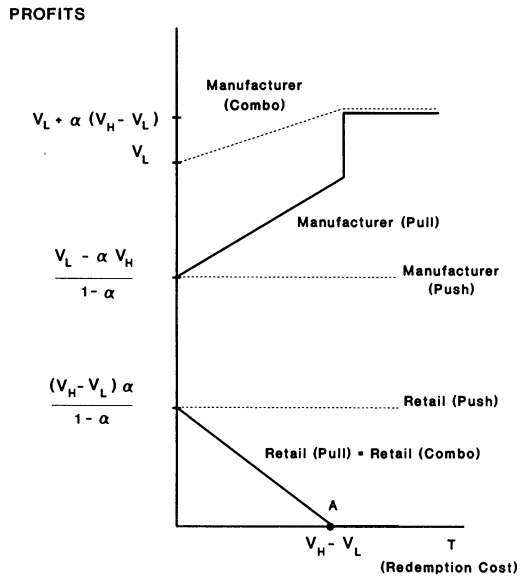

FIGURE 1. EQUILIBRIUM PROFITS

Notes: The solid lines are the profits when pure pull is used; the dashed lines are the profits when pure push is used. The dashed line beginning at V_L is the profit earned by either the push–pull combination or a direct channel.

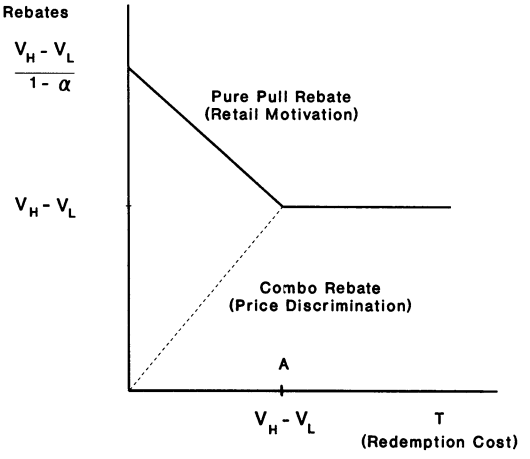

FIGURE 2. PURE PUSH VERSUS PUSH–PULL COMBINATION REBATES

Notes: The solid line is the conventional exclusive channel's pure push rebate. The dashed line is the rebate of a push–pull combination and a direct channel.

Result B: In a conventional exclusive channel, the large rebate required to motivate retail participation through pure pull is smaller than the trade deal required through pure push.

The relationship between the channel profits under pull and under push and the highs' redemption costs, T, is seen in Figure 1. Demand parameters, V_H, V_L, and α, are chosen so that the price promotions are profitable for the manufacturer [inequality (4) gives a sufficient condition]. Profits under pull are higher for the manufacturer everywhere. As the redemption-cost parameter gets larger, the threat of the retailer to counter the pull promotion diminishes (because the surplus that can be extracted from the highs is reduced). Therefore, a lower rebate, R^*, and retail price, $V_L + R^*$, motivate retail participation. With a lower rebate, the manufacturer's profits increase, and the retailer's profits decrease.

The optimal rebate value is decreasing with the redemption costs, as shown by the solid line in Figure 2. Eventually the redemption costs and the value of the rebate are equal. This occurs at point A in Figures 1 and 2, where $T = V_H - V_L$. At this point, the manufacturer has achieved two goals: all the consumers' surplus is extracted, and all the retailer's profits have been extracted. How does this occur simultaneously?

At point A the optimal rebate equals the highs' redemption costs, so the highs do not use the rebate, and price discrimination occurs. This is the point at which "large" rebates become "small" rebates. The retail price equals the highs' willingness to pay ($V_L + R^* = V_H$), and all the consumer surplus is extracted. Any increase in the retail price drives these customers out of the market, so the retailer cannot increase profits by selling just to the highs. At that point the retailer's threat to oppose the pull promotion has vanished, so the manufacturer ignores retail motivation and focuses instead on price discrimination, charging a wholesale price V_H and giving a rebate $V_H - V_L$.

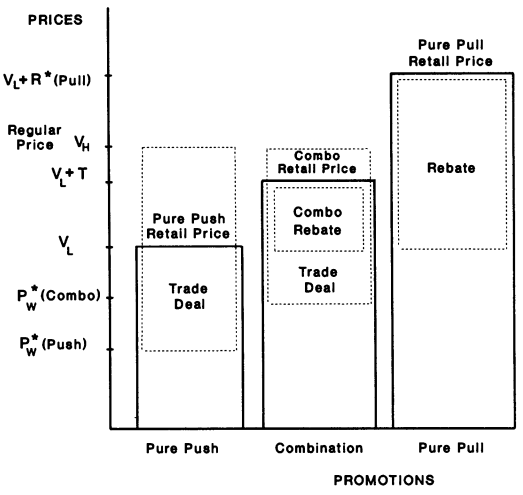

FIGURE 3. PRICE PROMOTIONS

Note: Rebates are indicated by dashed lines entirely within the solid box, and trade deals are indicated by dashed lines that extend outside the solid box.

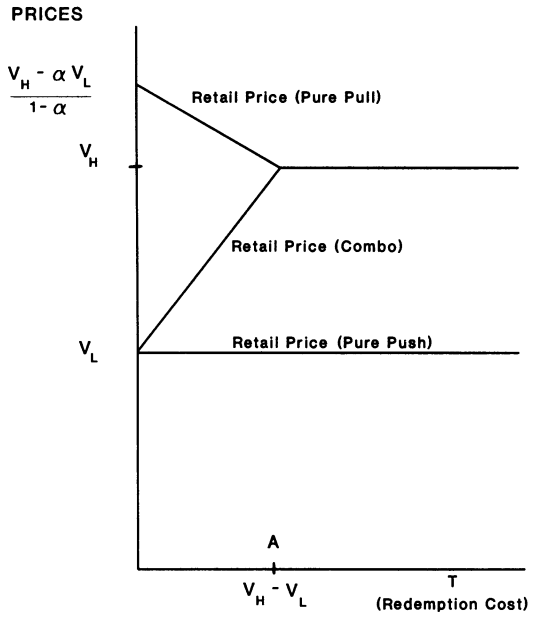

FIGURE 4. RETAIL PRICES AS A FUNCTION OF CONSUMERS' REDEMPTION COSTS

Recall that under push the retail price is discounted from V_H to V_L, but under pull the retailer responds to the rebates by charging a premium above the regular price, V_H, as shown in (6).

Result C: Under pure push the retail price is below the regular price, and under pure pull it exceeds or equals the regular price.

Results B and C are illustrated in Figure 3.

As redemption costs T increase up to $V_H - V_L$, the inflated "pull retail price" is lowered. At that point, the retail price equals the regular price, V_H, as shown in Figure 4.

Retailer.—Although total profits are identical under push and pull, the channel has a conflict over which promotion to use [see equations (8) and (9)].

Result D: In a conventional exclusive channel of distribution, the retailer prefers pure push (trade deals) to pure pull (manufacturer rebates).

Consumers.—Do consumers benefit from large rebates? With rebates, the retail price is raised substantially above the regular price (see Fig. 3), and consumers incur redemption costs. The following holds.

Result E: In a conventional exclusive channel of distribution, consumers prefer price promotions motivated by trade deals to manufacturer rebates.

The lows obtain zero consumer surplus under either push or pull, but the highs prefer push. Under push, the retail price is V_L, so the highs obtain a surplus of $V_H - V_L$. Under pull, the after-rebate price is V_L, so the highs obtain a surplus of $V_H - T - V_L$, including redemption costs. Consumer surplus is lower under pure pull because $T > 0$ when manufacturer rebates are offered.

Total Welfare.—Total welfare consists of channel profits and consumers' surplus (recall that all production costs are zero). Pure

push is efficient, since all the consumers buy the product with no extra redemption costs; total welfare equals $\alpha V_H + (1-\alpha)V_L$. Since total channel profit is V_L under both push and pull with large rebates, and since consumers benefit by a move from large rebates to pure push, the economy is not efficient with large rebates. All the consumers are sold the product, but highs must incur redemption costs to use rebates; total welfare equals $\alpha(V_H - T) + (1-\alpha)V_L$. When the high's redemption costs are sufficiently large to allow price-discriminatory rebates, the welfare improves, because the highs avoid using the small rebates; total welfare equals $\alpha V_H + (1-\alpha)V_L$.

Result F: In a conventional exclusive channel of distribution, pure push is efficient; pure pull is inefficient except with small, price-discriminatory rebates.

V. Combining Push and Pull

In a push–pull combination, the manufacturer gives a trade deal to the retailer (by setting the wholesale price below V_H) and at the same time offers a rebate to consumers. The use of these two tools typically can increase the manufacturer's profits relative to those obtained from pure pull or pure push. A rebate is used to price-discriminate between the highs and lows, and a trade deal is used to motivate retail participation. If the highs' transaction costs are too high, $T \geq V_H - V_L$, there is no difference between pure pull and combination push–pull, as explained below. The more interesting case is $T < V_H - V_L$.

Rebate Under Push–Pull Combination.—If $T < V_H - V_L$, then the optimal rebate that price-discriminates between the highs and lows is

$$R^*(\text{combo}) = T. \tag{13}$$

To see why (13) holds, note first that price discrimination will not occur if the value of the rebate is higher than the transaction cost T. Here, all customers use the rebate and pay an after-rebate price V_L. Therefore, to establish (13), we need only show that a rebate below T does not maximize manufacturer profit. $R < T$ implies: (a) highs do not use the rebate, (b) the retail price under participation, $V_L + R$, is below V_H (since $R < T < V_H - V_L$ by assumption), and (c) retail profit under participation, $V_L + R - P_w$, is unaffected if the rebate and wholesale price are increased by the same amount.

Keeping these points in mind, assume that $R < T$. The manufacturer can increase both the rebate and wholesale price by the same small amount, and retail profit is unaffected. Furthermore, the small increase in the rebate does not induce the highs to use it, but it does result in a slightly higher retail price, $V_L + R$. The highs still buy the product at the marginally higher retail price because it is still below their reservation price. Lows will also buy the product because the after-rebate price is still V_L. Why will equal small increases in rebate and wholesale price improve manufacturer profit? The answer is that the wholesale price increase contributes additional revenues on all units sold, but the rebate increase is paid only to the rebate users, the lows. That is, $R < T$ does not maximize manufacturer profit, and equation (13) holds.

Trade Deal Under Push–Pull Combination.—Because $R = T$, the highest retail price that induces all customers to buy the product is

$$P_r^*(\text{combo}) = V_L + T. \tag{14}$$

This price maximizes the retail profit because under participation the after-rebate price extracts all the lows' surpluses.

Retail profit under participation is $V_L + T - P_w$. Highs do not use the rebate and are willing to pay no more than V_H. If the retailer opposes the price promotion by selling only to the highs, the profit-maximizing retail price is V_H, and his profits equal $\alpha(V_H - P_w)$. To induce participation, the manufacturer will increase the wholesale price until participating and not participat-

TABLE 1—REBATES, TRADE DEALS, AND RETAIL PRICES

Type of promotion	Manufacturer's rebate	Trade deal	Retail price
Pure push	none	high	low
Pure pull	high	none	high
Combination	low	low	intermediate
Retailer rebate	none	intermediate	intermediate

TABLE 2—PROFITS

Type of promotion	Manufacturer's profit	Retailer's profit	Channel profit
Pure push	low	high	low
Pure pull	intermediate	low	low
Combination	high	low	high
Retailer rebate	intermediate	intermediate	high

ing are equally profitable. Setting the two retail profit expressions equal and solving for the trade deal under the push–pull combination gives

$$(15)\quad D^*(\text{combo}) = V_H - P_w^*(\text{combo}) = (V_H - T - V_L)/(1-\alpha) = D^*(\text{push}) - T/(1-\alpha).$$

The trade deal under combination push–pull is positive, so setting the wholesale price equal to the regular price is not optimal in the combination strategy. Comparing (15) to (1) and comparing (13) to (5), it is apparent that the push and pull components of the combination promotion are smaller than the pure push and pure pull values (see Fig. 3, Table 1). The combination retail price is between the retail prices that prevail under the pure promotion strategies (see Figs. 3, 4, Table 1).

Profits Under Push–Pull Combination.— Using equations (13) and (15), keeping in mind that the combination retail price is $V_L + T$ and that the rebate is paid only to the $1-\alpha$ lows, we find that the manufacturer's and retailer's profits are

$$(16)\quad \pi_m(\text{combo}) = P_w^*(\text{combo}) - (1-\alpha)T = \pi_m(\text{push}) + \alpha(2-\alpha)T/(1-\alpha)$$

$$(17)\quad \pi_r(\text{combo}) = V_L + T - P_w^*(\text{combo}) = \pi_r(\text{push}) - \alpha T/(1-\alpha).$$

The sum of these two profits, channel profit, is $V_L + \alpha T$.

Comparing these profits to the profits under pure pull and pure push gives Result G and Table 2.

Result G: The manufacturer prefers a push–pull combination to pure pull and prefers this to pure push. The retailer and consumers prefer pure push to either pure pull or push–pull combination, which are equally desirable. Channel profit is the highest under combination push–pull.

Explanation of these results is as follows. Unlike pure push or pure pull, the combination strategy provides the manufacturer with two promotional tools. The rebate is set at

TABLE 3—CHANNEL PROFIT, CONSUMER SURPLUS, AND WELFARE

Type of promotion	Channel profit	Consumer surplus	Total welfare	Allocation
Pure push	V_L	$\alpha(V_H - V_L)$	$\alpha V_H + (1-\alpha)V_L$	efficient
Pure pull	V_L	$\alpha(V_H - T - V_L)$	$\alpha(V_H - T) + (1-\alpha)V_L$	inefficient
Combination	$V_L + \alpha T$	$\alpha(V_H - T - V_L)$	$\alpha V_H + (1-\alpha)V_L$	efficient
Retailer rebate	$V_L + \alpha T$	$\alpha(V_H - T - V_L)$	$\alpha V_H + (1-\alpha)V_L$	efficient

T, the largest value that still prevents the highs from using it, and price discrimination is obtained. The trade deal is used to motivate retail participation. It just compensates the retailer for the lower retail price that prevails under combination, so the retailer is indifferent between pure pull and combination. Compared to pure pull, under a combination push–pull, highs do not incur redemption costs. The manufacturer captures these "savings" through price discrimination and earns higher profits.

Finally, consumers are indifferent between pure pull and a combination strategy. The retail price highs pay under combination is $V_L + T$. Under pure pull, they pay an after-rebate price, V_L, and incur transaction cost, T. Therefore, the surplus of each of the highs is the same under pure pull and push–pull combination: $V_H - T - V_L$. The lows get zero surplus under both regimes.

The dashed line beginning at V_L in Figure 1 describes channel profit under a push–pull combination (also under vertical integration, as will be seen in the next section) as a function of T. When T is small, a push–pull combination results in small rebates, price discrimination, and a higher manufacturer profit compared to pure pull. When T increases, the push–pull combination rebate increases, but the rebate offered under pure pull decreases, as can be seen from equation (5). Eventually, when T exceeds $V_H - V_L$, all consumer surplus is extracted, and profits and rebates are the same under both regimes.

The paths of the rebates under pure pull and the smaller rebate under push–pull combination (also offered by an integrated channel) are shown in Figure 2. Under both regimes, all consumers buy the product. However, under push–pull combination, only the lows use the rebate. That is, promotion using push–pull combination is more efficient than that using pure pull with large rebates because no one incurs redemption costs (see Table 3).

VI. Price Promotions in a Direct Channel

Suppose the retailer and manufacturer vertically integrate into one firm that deals directly with consumers. Call this a direct channel. Let us compare the price promotion of the direct channel to that of a conventional channel with exclusive retailer.

Pure Push.—In a direct channel, selling to all customers at V_L is more profitable than selling only to the highs at V_H if $V_L \geq \alpha V_H$. Comparing this condition to (4), one can see that sales are more likely to occur in the direct channel. Why? In the direct channel there is no need to motivate retail participation through deep trade deals.

Pure Pull.—Suppose that the regular retail price cannot be changed but that large rebates can be offered by a direct channel. The rebate required to reach the lows is equal to $V_H - V_L$. Comparing this to the rebate of pure pull in (5) [assuming that condition (7) holds], the rebate offered in the conventional exclusive channel is larger than the rebate offered in the direct channel because of the need to motivate retail participation.

The direct channel profits when using the rebate, V_L, exceed the profits from selling only to the highs, αV_H, when $V_L \geq \alpha V_H$. Comparing this condition with (10) gives a result like that for pure push: because there

is no need to motivate retail participation, rebates are more likely to occur in a direct channel than in a conventional channel with exclusive retailers.

Push–Pull Combination.—The direct channel price-discriminates to maximize its profit by offering a rebate of T and setting the retail price at $V_L + T$. The direct-channel profits are

$$(18) \quad \pi_d = \alpha(V_L + T) + (1-\alpha)V_L = V_L + \alpha T.$$

The direct-channel behavior under combination push–pull is the same as that obtained by a conventional channel. The following result summarizes all the above.

Result H: Price promotions are more likely in a direct channel than in a conventional exclusive channel.

VII. Retailer Rebates

So far in this study, only the manufacturer has been allowed to offer rebates. Sometimes, however, rebates are offered by retailers. Cash-back offers such as store coupons have become popular in recent years, and some retailers even pressure manufacturers to halt their coupon distribution or to decrease their values (Alleen Fahoy, 1989). In this section, we investigate retailer rebates.

Suppose the retailer realizes that price-discrimination opportunities exist through rebates and insists on offering his own rebate. How will the channel be affected if the manufacturer must stop offering rebates and use only trade deals?

Optimal Retailer Rebate and Price.—If only the retailer offers rebates, the retailer alone takes advantage of the price-discrimination opportunity by setting the rebate according to equation (13). A rebate higher than T encourages the highs to use it, so price discrimination does not occur. A rebate below T also is not optimal, because a small increase in the rebate enables the retailer to raise the list price by the same amount for all customers, but only the lows use the rebate. A rebate of T is optimal because it just deters the highs from using it, and the retail list price can be set at $V_L + T$ to extract the lows' surplus.

As long as $T \le V_H - V_L$, this is the optimal retailer behavior, but when $T > V_H - V_L$ the high retail price would drive the highs out of the market. In the large-redemption-cost region, the optimal rebate equals $V_H - V_L$, and the retail price is left equal to V_H. We will focus our attention below on the region of low redemption costs.

Profits Under Retailer Rebates.—To calculate profits, let us first consider how much money is made from each consumer segment. The retail price paid by the lows is $V_L + T$, and they use the rebate, T. Each low contributes V_L to retail revenues. The highs pay the retail price but do not use the rebate, so each high contributes $V_L + T$ to retail revenues. Total retail profit equals $V_L + \alpha T - P_w$ (the α highs pay a premium of T). When selling only to highs at the regular price, retail profit is $\alpha(V_H - P_w)$.

What is the lowest trade deal that motivates the retailer to offer rebates and to sell to all customers? The wholesale price can be adjusted until the retailer is just indifferent between participating or not. Set the two retail profit expressions equal and solve for the trade deal that maximizes the manufacturer's profit:

$$(19) \quad D^*(\text{retail rebate}) = V_H - P_w^*(\text{retail rebate}) = (V_H - \alpha T - V_L)/(1-\alpha) = D^*(\text{push}) - \alpha T/(1-\alpha).$$

Comparing the trade deal under retail rebates (19) to those under pure push (1) and combination push–pull (15), the trade deal with retailer rebates is of intermediate size. The retail price under this regime is also of intermediate size compared to those under the pure pull and pure push regimes and

equal to that of push–pull combination (see Table 1, Fig. 3).

The manufacturer and retailer profits under retailer rebates are

$$(20)\quad \pi_m(\text{retail rebate}) = P_w^*(\text{retail rebate}) = \pi_m(\text{push}) + \alpha T/(1-\alpha)$$

$$(21)\quad \pi_r(\text{retail rebate}) = V_L + \alpha T - P_w^*(\text{retail rebate}) = \pi_r(\text{push}) - \alpha^2 T/(1-\alpha).$$

Comparing (20) and (21) to the equivalent profit expressions derived above for pure push, pure pull, and combination push–pull, the following result holds (see Table 2).

Result I: Under retail rebates, the manufacturer earns the same intermediate profit that is earned under the pure pull regime. Retailer profit is intermediate; it is lower than in the pure push regime, but it is higher than in the pure pull and combination push–pull regimes.

The intuition for Result I is as follows. Retailer rebates enable the retailer to price-discriminate, so the retailer is more inclined to participate in a push price promotion sponsored by the manufacturer. This means that a relatively small trade deal is required to motivate retail participation. With the lower trade deal, the manufacturer earns the same profit he would have earned under pure pull. Retailer rebates help the retailer earn higher profits compared to those gained under pure pull or combination push–pull, because manufacturer rebates limit the retailer's threat not to participate and to extract all the surplus from the highs, as explained above.

Consumers are indifferent between large manufacturer rebates (pure pull) and retailer rebates. Recall that all the highs use the large rebates and obtain surpluses of $V_H - T - V_L$ each, and lows pay V_L and obtain zero surplus. With retailer rebates, customers obtain the same surplus because highs pay $V_L + T$ and lows pay V_L. Table 3 provides a complete comparison of channel profits, consumer surplus, and total welfare obtained under each regime.

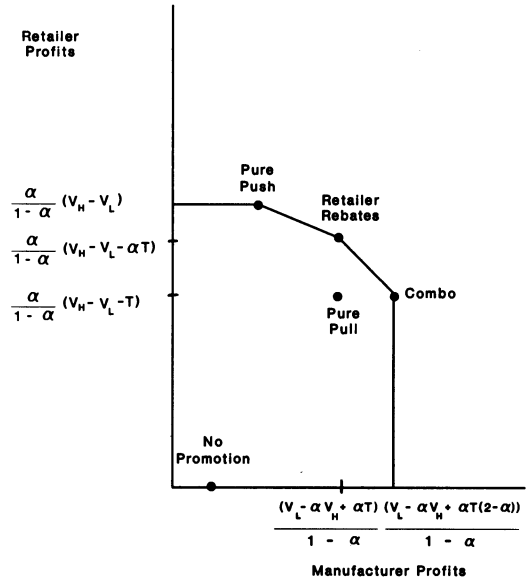

FIGURE 5. MANUFACTURER AND RETAILER PROFITS FROM PRICE PROMOTIONS

Finally, Figure 5 shows how profits are allocated between the manufacturer and retailer under different price promotions. Suppose an agreement about the channel price-promotion strategy must be reached. What is likely to prevail? No promotions and pure pull are not likely candidates, because retail rebates dominate both. The retailer will argue for push, and the manufacturer will argue for the push–pull combination. Adopting a retailer-rebate strategy is a compromise that might occur if bargaining power and risk aversion were similar for both parties.

VIII. Conclusion

Trade and consumer price promotions typically are analyzed independently in industrial organization (Jean Tirole, 1988) and

marketing (Philip Kotler, 1988). This paper provides new insights into such price promotions and their roles within a channel framework.

We investigated four types of price promotions: pure push (trade deals only), pure pull (manufacturer rebates only), push–pull combination (both trade deals and rebates), and retailer rebates. It was shown that manufacturers' rebates can be used not only to price-discriminate but also to motivate retail participation. Rebates reduce a retailer's opportunistic desire to raise prices in response to such pull promotions if the redemption costs are higher for the customers with higher willingness to pay. Therefore, the retailer is willing to participate in the promotion at a profit level lower than those experienced under push, where trade deals are offered. The rebates required to motivate retail participation are so large that no consumer could resist them. This explains why large rebates may exist even in circumstances when all customers use the rebates.

We showed that price promotions are more likely to occur in a direct channel than in the indirect exclusive channel, because the manufacturer needs to motivate the retailer to participate in the price promotion through deep trade deals or large rebates. We also explain why manufacturers may offer rebates together with trade promotions, a push–pull combination. The combination yields higher profits to the manufacturer because price discrimination is obtained. The retailer wants pure push but prefers retail rebates to pure pull or push–pull combination. Rebates initiated by the retailers are efficient, but they decrease the manufacturer's profits compared to those gained under the push–pull combination.

Consumers are better off with price reductions motivated by trade deals than with large rebates. Using the rebate involves transaction costs. Moreover, the retail price is increased by the value of the rebate.

How robust are these results to changes in the model's specifications? Will the manufacturer still prefer pure pull (Result A) and will the retailer still prefer pure push (Result D) if the lows have positive redemption costs, the manufacturer has positive costs of processing rebates, or the demand within each segment is continuously decreasing in price?

If the redemption costs of the lows are positive but small (so that a strong positive association between willingness to pay and redemption costs remains), Results A and D still hold. How strong must the association be between redemption costs and willingness to pay? If we let t denote the redemption costs of the lows, then $t < \alpha T$ is sufficient for these results (Gerstner and Hess, 1991). As redemption costs of the lows grow, the gap between the two segments' willingness to pay enlarges, making the retailer's threat not to cooperate more potent. Therefore, pull becomes more costly for the manufacturer when t increases, and eventually the manufacturer will prefer push when $t > \alpha T$. Not all the results carry over in this more general case, however. For example, with these added redemption costs, small rebates are also inefficient, because the lows use them and bear an unnecessary redemption cost.

Economic theory suggests, however, that both willingness to pay and value of time are positively correlated with income and thus with each other. Opportunity cost of time is, of course, one of the important elements of redemption costs. Manufacturers deliberately impose transaction costs to deter certain market segments from using rebates (*Consumer Reports*, 1986).

Within each homogeneous consumer segment, demand for the product is a step function, not a continuous monotone function. Some results are identical for step-function and continuous monotone demand curves. With linear demand functions, the retailer prefers pure push to pure pull, just as in Result D. This is because the redemption costs not only reduce the retailer's threat not to participate, but also lower sales volume from the highs. Both forces work against pure pull.

If within each segment the demand were price sensitive, some of the conclusions of this paper would hold only in a range of

circumstances narrower than those above. For example, if the demand curve of the typical consumer in each segment were a continuous linear function (with larger intercept for highs), the manufacturer might possibly prefer pure push to pure pull, contrary to Result A. This is because redemption costs not only benefit the manufacturer (reducing the threat of the exclusive retailer not to participate), but also cost the manufacturer by reducing sales volume from the highs. However, for small redemption costs the manufacturer's benefits exceed costs. Delineating the exact conditions under which the model specifications create different conclusions will be left to future investigations.

Although we consider a conventional channel with a single manufacturer selling to a single retailer, the model is applicable to a situation with several retailers who have local, spatially determined monopoly power. In another paper (Hess et al., 1990) we consider push and pull promotions in a framework of competitive, nonexclusive retailers.

To focus on the manufacturer–retailer channel conflict, we assumed that the execution costs of all promotions as well as the retailing cost were zero. Considering communication and distribution costs, pull price promotions are usually more costly and thus less attractive to the manufacturer, because the number of consumers is far larger than the number of distributors. The wide use of these promotions, however, indicates that their benefits are substantial.

Timing and inventory issues such as frequency of price promotions (Joel Sobel, 1984; Scott Neslin et al., 1985; Jagmohan Raju et al., 1990) or forward buying (Robert Blattberg et al., 1981; Steven Salop and Joseph Stiglitz, 1982; Robert Buzzell et al., 1990) were not considered in this paper. Although these topics received some attention in the literature, important channel issues have been ignored until recently. The topic of channel price promotion seems to be a promising one for further exploration, and it is our hope that this paper will stimulate additional work.

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