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PULL PROMOTIONS AND CHANNEL COORDINATION

EITAN GERSTNER AND JAMES D. HESS
University of California, Davis
University of Illinois

This paper recommends that manufacturers consider a pull price promotion as a coordination device in an independent channel of distribution. Uncoordinated decisions of both manufacturer and retailer to charge high prices can break down the effort to expand the market, resulting in losses to the channel as a whole. We show that manufacturers can enhance channel price coordination by designing pull price discounts that target price-conscious consumers. The increased price coordination improves total channel profits and consumer surplus. Supporting pull with push increases the probability of coordination.
(Channels of Distribution; Promotions; Pricing Research)

1. Introduction

Often conflict within a channel of distribution plunges from a tussle over the division of total profits to a pernicious destruction of potential channel income. Both manufacturer and retailer's self-interested marketing decisions inadvertently can damage profits of the other. Price coordination within a channel is especially hard to achieve because by law manufacturers cannot dictate prices to retailers. For example, in May of 1983 Bumble Bee Seafoods reduced its price to the trade 19¢ per can of tuna fish. One New York grocery store ran a one-week price reduction in Bumble Bee white tuna from $1.39 to $.99 but then pocketed the manufacturer's push money for more than a month (Williams 1983), stymieing the manufacturer's hope of expanding its customer base.

There are many sources of channel miscoordination. First, technological externalities can exist in the channel. For instance, a manufacturer might choose a low quality design without considering the impact on the profits of the distributor who will be forced to complement the product with costly repairs. Second, informational asymmetries cause channel problems. Manufacturers, for example, may have extensive market research that tells them a new product is a certain winner, but since talk is cheap and many other companies are making such claims, the retailer may refuse to carry the profitable new product (Chu 1992, Messinger and Chu 1993). Third, many channel activities such as advertising, public relations, and personal selling have a public good nature (provided to one, provided to all). Free-riding may result, as when discounters provide less service than the manufacturer requests, counting on high priced, full service retailers to perform the task.

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Fourth and the subject of this paper, when an independent retailer with some monopoly power sets a high price to maximize its own profit and the manufacturer also seeks a large profit margin, the excessive margin for the entire channel can exclude consumers who would be profitable clients for an integrated channel. This cause for channel inefficiency is called *double marginalization* (Spengler 1950, Moorthy 1988, Bolton and Bonanno 1988, Tirole 1989, pp. 174–175, Lilien, Kotler, and Moorthy 1992, p. 419).

The most obvious remedy for channel miscoordination is vertical integration. This provides a governance structure that may internalize the problem (although transfer pricing does not eliminate disputes; see Eccles 1985). However, vertical integration by creating new exclusive distribution outlets involves large startup costs, and mergers have serious legal limitations.

Because integration is not always feasible, a variety of management strategies have been interpreted as mechanisms for correcting this lack of channel coordination. Among these are franchising, competition between retailers, incentive compatible contracts, implicit understandings from repeated interaction, profit sharing, quantity discounts, exchange of personnel, and arbitration (Jeuland and Shugan 1983, Shugan 1985, McGuire and Staelin 1986, Stern and El-Ansary 1992, pp. 300–309).

This paper highlights a practical alternative that alleviates double marginalization—*targeted pull pricing strategy*, in which the manufacturer offers discounts directly to price-conscious consumers, expecting them to ask the retailer for the product. The targeted pull discount induces the retailer to retain customers that are profitable for the entire channel, and as a result, increases total channel profit and consumers' welfare compared to the outcome under double marginalization.

Previous research on double marginalization focused on two-part tariffs (Zusman and Etgar 1981, McGuire and Staelin 1986, Moorthy 1987, Bonanno and Vickers 1988), quantity discounts (Jeuland and Shugan 1983), and vertical integration or profit sharing arrangements (Jeuland and Shugan 1983, Coughlan and Wernerfelt 1989, and Lal 1990).[1] Jeuland and Shugan (1983, p. 265) recommend quantity discounts over two-part tariffs (a fixed fee plus a per unit price) because two-part tariffs imply the manufacturer is in a more powerful position than the retailer, a controversial assumption (Messinger and Narasimhan 1993 find little evidence of growing grocery store power). Moorthy (1987), on the other hand, argued that quantity discounts are more complex than two-part tariffs and can violate the Robinson-Patman Act's prohibition of price discrimination among retailers. He also cited McGuire and Staelin's (1986) work as evidence that two-part tariffs are acceptable to retailers. In reply, Jeuland and Shugan (1988) agreed that two-part tariffs are simpler to implement but thought that quantity discounts are valuable when neither manufacturer nor retailer has dominating control over the pricing decision and point out that Oi (1971) shows that two-part tariffs can also be discriminatory.

Using targeted pull, manufacturers can avoid some of these problems. First, if pull discounts price discriminate, it is among consumers, not retailers, and therefore the Robinson-Patman Act is not violated (because injury to competition does not occur). Moreover, channel coordination through pull can be achieved without consumer price discrimination (when all consumers use the discount), as we will show below. Second, pull requires neither extensive communications nor negotiations between channel members. Third, pull discounts are desired for other reasons, such as product trial, advertising, or inventory cost shifting, so improved channel coordination may be just a desirable by-product. Finally, assuming channel coordination, Gerstner and Hess (1991a and 1991b) show that targeted pull pricing is more profitable in theory than push pricing (a wholesale price discount) when channel coordination is not a problem.

[1] These researchers assume that the demand function is known with certainty. Rey and Tirole (1986a and 1986b), and Chu (1992) assume incomplete information about demand.

Pull pricing has draw backs, however. First, it assumes that the manufacturer takes leadership in setting prices, just like with two-part tariffs. Second, to use this technique effectively, the manufacturer must accurately target the pull discount to price-conscious consumers, and make it difficult for other consumers to use. If the targeting is inaccurate, the effort to improve channel price coordination may not be successful. Third, targeting and distributing pull discounts directly to consumers is costly to the manufacturer, and the handling fee paid to retailers may not cover their actual cost.

The paper examines a situation in which an independent retailer would pocket a manufacturer's wholesale price discount. Thus, while it may be optimal for the channel to expand sales, the manufacturer has no incentive to do so. The integrated channel would. This lack of channel price coordination prevents the channel from obtaining higher profits, and consumers from receiving a higher surplus. We call this situation *channel pricing breakdown*. The paper goes on to show how such a breakdown can be repaired through pull discounts.

Channel price coordination improves when the manufacturer carefully designs the pull so the discount is accessible to the targeted price-conscious consumers but hard to get for the non-targeted segment. If the manufacturer targets the pull discount inaccurately, so that all consumers have equal excess to it, effort to improve channel price coordination can be counterproductive.

2. Breakdown in Channel Price Coordination

This section shows how the independent, self-interested decisions of manufacturer and retailer can lead to a breakdown in price coordination within a channel, and as a result, total channel profits and consumer welfare are not maximized.

Consider such a channel where the monopolist manufacturer distributes a single product through an exclusive independent retailer.[2] The retailer sets the price to maximize retail profit, taking the wholesale price as given, and the manufacturer chooses the wholesale price to maximize manufacturing profit, taking the retailer's pricing behavior into account. Because manufacturing and retailing costs are irrelevant for the analysis, they are assumed for simplicity to be zero. We follow the standard principal/agent tie-breaking assumption that when the retailer earns equal profits in two different alternatives, he chooses the alternative preferred by the manufacturer.

Two consumer segments make up the market: high willingness-to-pay consumers (*Highs* for short) and low willingness-to-pay consumers (*Lows* for short). The consumer demand has a simple staircase shape seen in Figure 1 that captures the essence of distinct market segments (for other pricing models that used this demand see Varian 1980, Lazear 1986, Gerstner and Holthausen 1986, Pashigian 1988 and Raju, Srinivasan and Lal 1990).[3] In Figure 1 the Highs will pay \$3.00 for the product and the Lows only \$2.00. Half the market consists of Highs and half Lows.

This independent channel is compared against a benchmark: a vertically integrated channel. A vertically integrated channel would set a price of \$2.00 to maximize the profit that can be obtained from the two segments. Revenue is higher when both segments buy than when only Highs buy ($1.0 \times \$2.00 > 0.5 \times \$3.00$).

Let us see how channel price coordination breaks down. The manufacturer faces two

[2] The double marginalization problem described below only arises when both channel members have some degree of monopoly power.

[3] Within each homogeneous consumer segment, demand for the product is zero or one rather than a continuous, decreasing function of price. If the demand of each consumer segment was linear, then the aggregate demand would be piecewise linear. Although pricing decisions are more complicated in this case, it is possible to show that pure pull may still enhance channel price coordination.

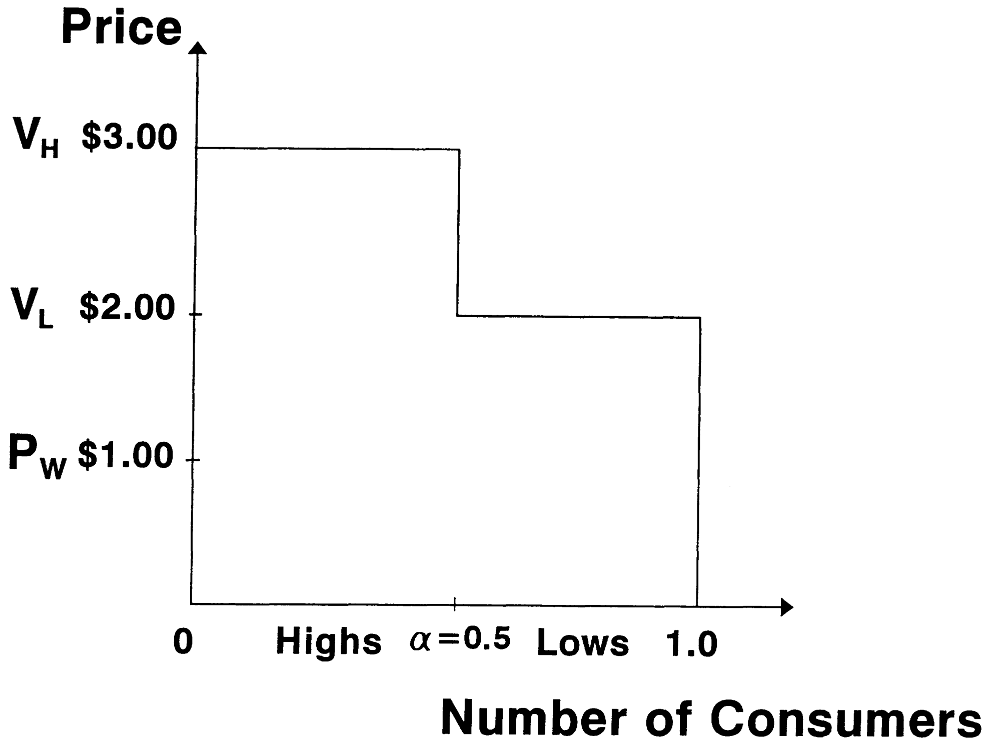

FIGURE 1. Consumer Demand.

alternatives. First, the manufacturer can earn a high margin but sell few units by setting a \$3.00 wholesale price. The ensuing retail price will be \$3.00, as any lower price would generate negative margins. The retailer will remain in business though he earns zero economic profit (recall the standard tie breaking assumption), and the manufacturer earns \$1.50. Total channel profit is \$1.50.

Second, the manufacturer can motivate the retailer to sell to the entire market by setting a low wholesale price. The retailer, however, wants a high retail margin and may pocket a wholesale price reduction by leaving the retail price at \$3.00. To induce sales to the entire market, the manufacturer must choose a wholesale price no higher than \$1.00. At exactly \$1.00, the retailer will cooperate because identical \$1.00 profits are earned by selling to the entire market at \$2.00 or by selling only to the Highs at \$3.00. The manufacturer and retailer each secure a margin of \$1.00, and total channel profit is \$2.00.

Given the outcome of these two alternatives, the individual incentive of the manufacturer is incompatible with the channel's best interest. The manufacturer earns \$1.50 with high margins and only \$1.00 with low margins and so chooses high margins. However, the entire channel earns only \$1.50 under the first alternative but \$2.00 under the second. If the manufacturer and retailer join forces and commit to a retail price of \$2.00, the channel as a whole benefits. In addition, consumers are also hurt by the breakdown because each High's surplus (willingness-to-pay less price) is reduced from \$1.00 to zero.

This example shows how independent pricing decisions of the channel members exclude a consumer segment that would be profitable for the entire channel. The cause of this breakdown in channel price coordination is double marginalization. Double marginalization arises in the pricing of the product in an independent channel because in separately maximizing their profits, channel members attempt to earn larger margins than would be optimal in a coordinated channel (if the channel was a succession of three firms then the appropriate term would be triple marginalization). We summarize this in the following result.

Result 1. Double marginalization can lead to a breakdown in channel price coordination, and, as a result, total channel profit and consumer welfare are not maximized.

Under what conditions is channel breakdown likely? To answer this we now turn to a more general analysis. To establish notation, suppose the manufacturer sells the product at wholesale price, P_w, to the retailer who resells it to consumers at a retail price, P_r. Highs have a reservation value V_H, and Lows have a reservation value V_L, where $0 < V_L < V_H$. Market size is 1.0, divided into α Highs and $1 - \alpha$ Lows, where $0 < \alpha < 1$. For any given wholesale price, the retailer always considers seeking a large margin by selling only to the Highs at their reservation price, V_H. The manufacturer's best response to a retailer who pursues opportunistically large margins is to set the wholesale price equal to V_H, driving the retailer's profits to zero. To induce sales to the entire market, the manufacturer must adopt a wholesale price that coaxes the retailer to price at V_L. What wholesale price provides the best incentives?

The retailer's profit from selling only to Highs at a price V_H is $\alpha(V_H - P_w)$. The profit from selling to all customers at a price V_L is $V_L - P_w$. To obtain channel coordination, the manufacturer adjusts the wholesale price until the retailer is just indifferent between the two options. Setting the two retail profit expressions equal and solving for the wholesale price yields

$$P_w^* = V_H - (V_H - V_L)/(1 - \alpha). \tag{1}$$

The resulting profits of manufacturer and retailer when both Highs and Lows buy are

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

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

The independent channel's total profit when selling to the entire market is V_L.

The independent manufacturer prefers to sell only to the Highs and to exclude the Lows if profit π_m^* is less than the profit from selling only to Highs, αV_H; this occurs if

$$V_L < \alpha V_H(2 - \alpha). \tag{4}$$

In contrast to this independent channel, the vertically integrated channel decides to sell to all consumers at a price V_L rather than sell only to the Highs at a price V_H when

$$\alpha V_H < V_L. \tag{5}$$

The channel breaks down when the independent manufacturer and retailer exclude the Lows from their sales plans, but a vertically integrated channel would not. Formally, combining inequalities (4) and (5) gives the region of breakdown due to double marginalization,

$$\alpha V_H < V_L < \alpha V_H(2 - \alpha). \tag{6}$$

The region of breakdown in channel price coordination is shaded in Figure 2. Below the line labeled A, the willingness-to-pay of the Lows is so small that even the integrated channel would not want to sell to them. Above the line labeled B the willingness-to-pay of the Lows is so large that even the independent channel would want to sell to them. In the breakdown region selling to Lows is desirable for the channel but unprofitable for the manufacturer, who must sacrifice too much profit to provide proper incentives to the retailer, so the independent channel excludes Lows.

This breakdown also harms consumers. In an integrated channel, all consumers buy the product at a low price, V_L. Highs obtain a positive surplus, $V_H - V_L$, whereas the Lows get zero surplus. The double marginalization breakdown implies that the product is purchased only by the Highs at a high price, V_H, so all consumers get zero surplus.

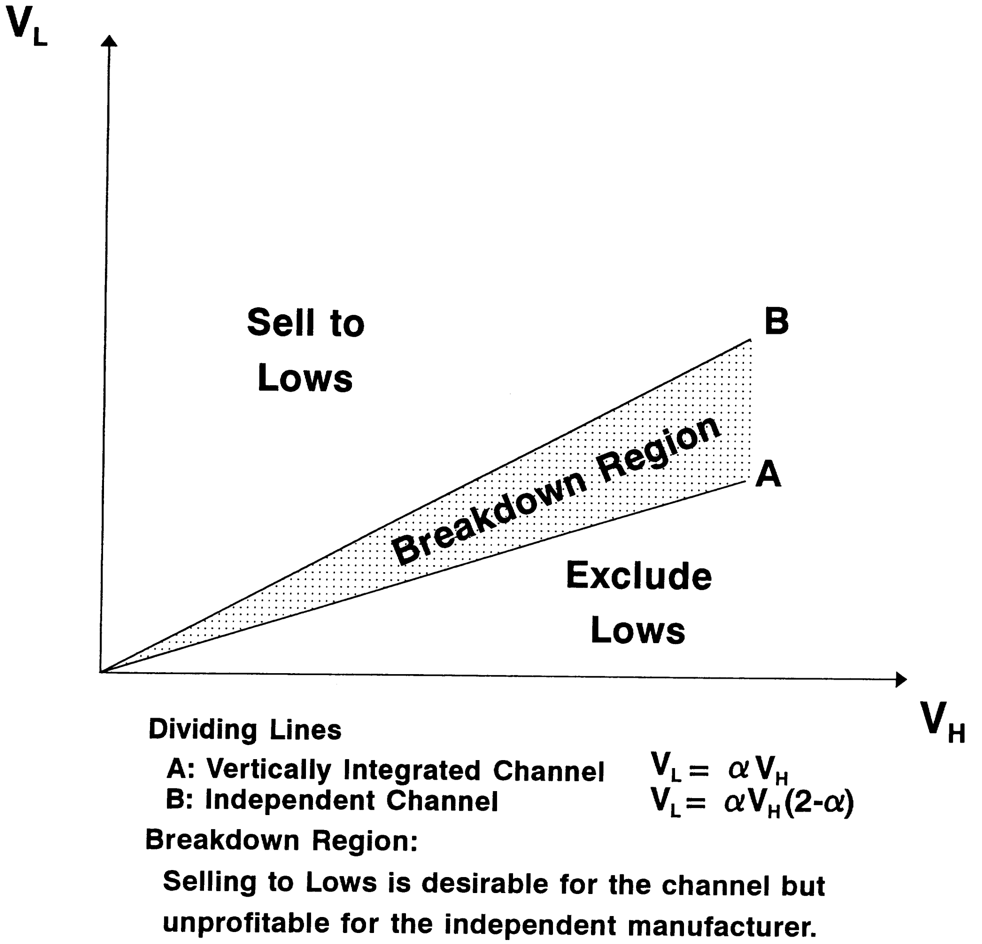

FIGURE 2. Breakdown Region.

Next, we show that pull promotion can repair the channel breakdown because it makes the retailer's demand more elastic with respect to price. By doing so, the alternative of selling only to the Highs at the high price is less tempting to the retailer compared to the alternative of selling to all consumers at a reduced price. As a result, pull promotion makes the retailer more inclined to cooperate.

3. Can Pure Pull Repair Channel Price Breakdown?

A manufacturer's pull discount would be most effective if offered only to those consumers (the Lows) who are least likely to buy the product otherwise. Such perfect targeting of the pull is unlikely, but we do assume that the discount is more easily obtained by the Lows than the Highs. That is, consumers' transaction costs of using the pull discount is higher for the Highs.[4] However, perfectly targeting the pull is not essential to repair the damage of double marginalization. We return to this important issue in §5.

[4] Airlines make it hard on business travelers to use low fares aimed at vacation travelers by requiring advanced ticketing or over weekend stay. Manufacturer rebates often require significant processing time to eliminate users who have high income. Other differential transaction costs are achieved through distribution in selective geographical areas, media, or shopping locations.

The use of discounts by consumers is modeled in a simple way. A consumer must exert effort to obtain the pull discount, and this effort has a monetary equivalent called the transaction cost. If the pull discount exceeds the transaction cost, the consumer uses the discount. For simplicity we normalize the Lows' transaction costs to zero, and denote by T the transaction costs of the Highs. That is, T should be interpreted as the transaction cost differential between the Highs and the Lows (see footnote 7 below).

We want to distinguish the gains that accrue to pull from improved channel price coordination from other gains, such as category expansion or price discrimination. In particular, if transaction cost differences are great enough, the Highs will not use the discount and pull price discriminates between the two consumer segments. To show that such "pure pull" strategy can enhance channel price coordination even when price discrimination does not take place, it is first assumed that the pull discount is so large that all customers use it.

Moreover, to focus on pull as a channel price coordination tool, we will first deliberately exclude other channel coordination mechanisms from the analysis. In particular, push pricing is excluded by assuming that the wholesale price is left at the level that occurs under channel pricing breakdown, $P_w = V_H$. Push pricing and discriminatory pull improve channel price coordination, as we show in §4. Here we allow only pure pull.

Returning to the numerical example, consider what happens if the manufacturer offers a pull discount of $1.25, leaving the wholesale price unchanged at $3.00. To show that channel profits improve even when all consumers use the pull discount, assume that the Highs' transaction costs are less than the discount, say $0.75. As before, the opportunistic retailer examines two options: sell to all customers or sell to just the Highs (see Figure 3).

The highest price the retailer could charge and still sell to all consumers is $3.25, because the Lows add the $1.25 discount to their willingness-to-pay, $2.00. The wholesale

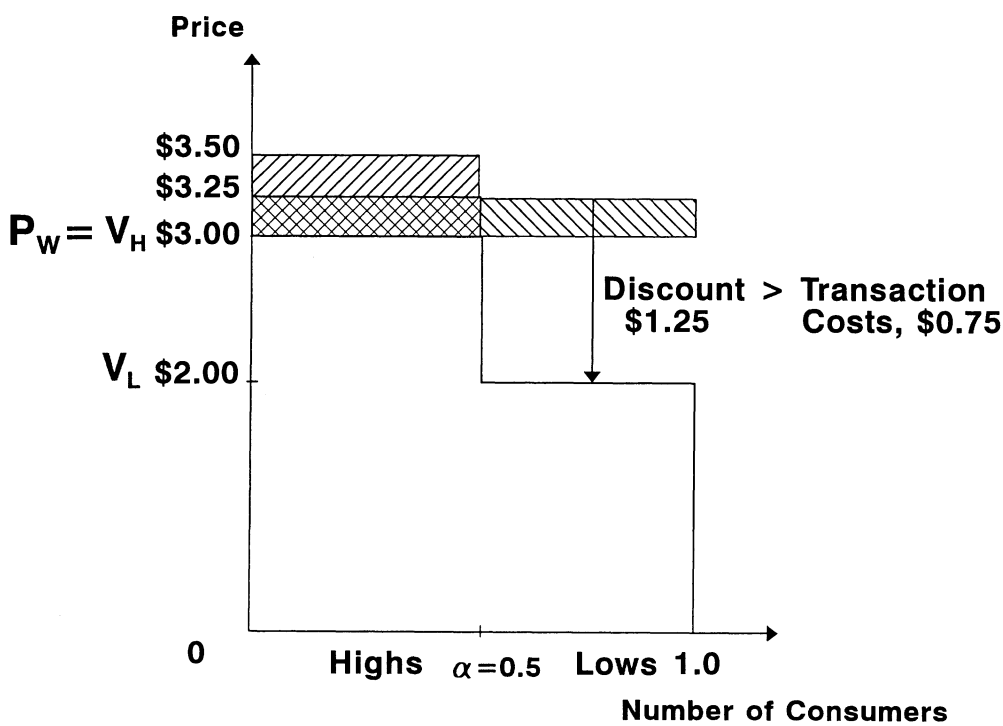

FIGURE 3. Channel Repair Under Pure Pull.

price is \$3.00 and the sales volume is 1.0, so the retailer obtains a profit of \$0.25 (the downward diagonally hatched region plus the cross hatched region of Figure 3).

The highest price the retailer could obtain when selling only to the Highs is \$3.50, because the Highs add the \$1.25 discount to their willingness-to-pay, \$3.00, but subtract their transaction costs, \$0.75. The sales volume is 0.5, so the retailer earns a profit of \$0.25 (the upward diagonally hatched region plus the cross hatched region of Figure 3).

Because the retailer cannot earn higher profits by selling only to the Highs, he cooperates and sells to all consumers. All channel members have higher profits with pure pull than with channel breakdown. Under pure pull the manufacturer's profit of \$1.75 (wholesale price less discount) exceeds his profit under breakdown, \$1.50. The retailer profit with pure pull, \$0.25, also exceeds the zero profit obtained under breakdown. Finally, consumers also benefit from pure pull because each High obtains a positive surplus of \$0.25 (willingness-to-pay, \$3.00, plus discount, \$1.25, minus transaction costs, \$0.75, minus retail price, \$3.25). In summary, the following result holds.

Result 2. Pure pull can improve channel price coordination. This is true even if all consumers use the discount.

To establish conditions that support this result, consider the more general case. Under pure pull the wholesale price is left at the same level as under channel breakdown, $P_w = V_H$, and the manufacturer offers consumers a pull discount, D. The transaction cost the Highs incur to use the discount, T, is assumed first to be less than $V_H - V_L$. This guarantees that all customers use the pull discount, as we will show below. That is, the pure pull is nondiscriminatory. The discriminatory case, $T > V_H - V_L$, is discussed in footnote 6.

Now consider the retailer's behavior under pure pull. The pull discount gives the Highs a net price reduction of $D - T$. The retailer calculates that Highs would be willing to pay a retail price of $V_H + D - T$ and that Lows would be willing to pay $V_L + D$, taking the discount into account.[5] If the retailer is uncooperative, the retail price could be set as high as $V_H + D - T$ and only the Highs would buy. Under cooperation the retailer adopts a price equal to $V_L + D$ and both Highs and Lows buy. The corresponding retail profits are $\alpha[(V_H + D - T) - V_H] = \alpha(D - T)$ without cooperation and $(V_L + D) - V_H$ with cooperation.

To motivate channel coordination, the profit-maximizing manufacturer adjusts the pull discount until the retailer is just indifferent between cooperating or not. To calculate this discount, set the two retail profit expressions equal and solve for D:

$$D^* = (V_H - V_L - \alpha T)/(1 - \alpha). \tag{7}$$

The profits of the manufacturer and retailer when cooperation is induced are

$$\pi_m^* = V_H - D = (V_L - \alpha V_H + \alpha T)/(1 - \alpha) \quad \text{and} \tag{8}$$

$$\pi_r^* = V_L + D - V_H = [\alpha(V_H - V_L) - \alpha T]/(1 - \alpha). \tag{9}$$

Total channel profit equals V_L.

A breakdown in channel price coordination occurs when both inequality (5) holds (that is, an integrated channel would sell to all consumers) and when manufacturer profit (8) is smaller than the profit from selling only to the Highs, αV_H. Combining these two inequalities gives the breakdown region under pure pull,

$$\alpha V_H < V_L < \alpha V_H(2 - \alpha) - \alpha T. \tag{10}$$

Comparing the channel breakdown condition with pure pull, inequality (10), to the equivalent condition without pull, inequality (6), one can see that pure pull shrinks the

[5] Levedahl (1984), Vilcassim and Wittink (1987), and Hess and Gerstner (1993) show that retail prices reflect the value of pull discounts.

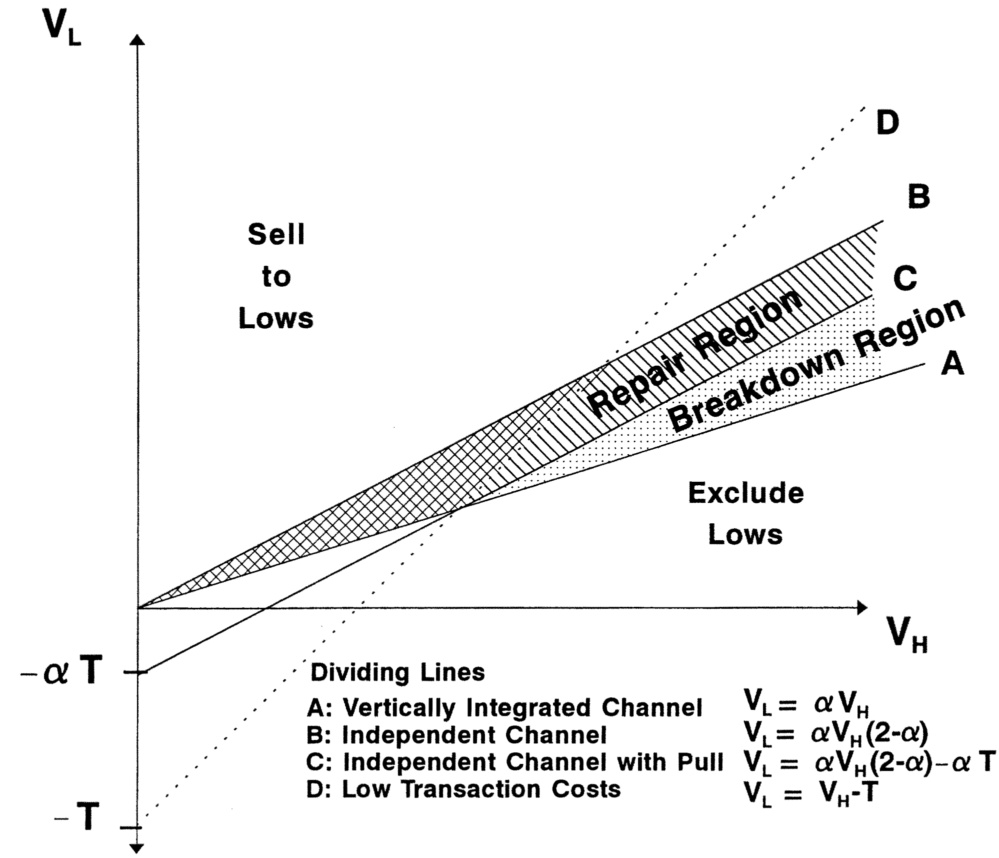

FIGURE 4. Repair Region with Pure Pull.

breakdown region: the right-hand-side of the inequality is reduced by αT. This means that the probability of price coordination would increase if the manufacturer can make the pull discount more accessible to the targeted price conscious segment and harder to use for the nontargeted consumers who would buy the product without the discount by raising the transaction cost differential, T.[6] This is summarized in the following result.

Result 3. Targeting the pull discount to the price-conscious consumers and making it less accessible to the price-insensitive consumers increases the probability of improved channel price coordination.

The parallel hatched area in Figure 4 illustrates the constellation of parameters under which targeted pull repairs the breakdown in price coordination within the channel. The breakdown region (shaded with dots) obviously is smaller in Figure 4 than in Figure 2.

Result 3 is driven by the following intuition. Targeted pull reduces the difference in willingness-to-pay between the two segments, and as a result the retailer faces a more elastic demand. The more elastic demand makes price reductions more profitable for the retailer, so he is more willing to cooperate and sell to the Lows. How can pull strategy do the trick?

[6] The most desirable situation for the manufacturer is to completely prevent the Highs from using the pull discount. This is possible if he could impose on them transaction costs high enough that satisfy, $T \geq V_H - V_L$. In this case, the optimal pull discount is $D = V_H - V_L$ for the following reason. When T equals the difference in willingness-to-pay, $V_H - V_L$, all consumer surplus is extracted because $P_r = V_L + T = V_H$. When T exceeds $V_H - V_L$, the pull discount cannot be increased without driving the Highs out of the market. So, if the transaction cost is high enough, the pull discount allows the manufacturer to extract all the consumers' surpluses.

Recall that without targeted pull the difference in willingness-to-pay is $V_H - V_L$. Since we normalized the Lows' transaction costs to zero, their willingness-to-pay is increased by the full amount of the pull discount to $V_L + D$.[7] The Highs, on the other hand, incur a transaction cost, so their willingness-to-pay is increased to $V_H + D - T$. As a result of the targeted pull the difference in willingness-to-pay is reduced to $V_H - V_L - T$, and demand is more elastic. The higher the transaction cost differential, T, the lower is the willingness-to-pay differential, and as a result, the lower is the probability of breakdown in channel price coordination.

What if the manufacturer cannot accurately target the pull to the price-conscious segment? In this case the transaction cost differential, T, will approach zero (or it can even be negative), and the pull will be counterproductive; it will not prevent breakdown in channel price coordination.

Under well-designed pull, however, price coordination can result not only in higher total channel profits but also in improved consumer surplus. Under coordination, the Lows get zero consumer surplus, but the Highs obtain a positive surplus of $V_H - V_L - T$ compared to the zero surplus obtained if the channel breaks down. Total welfare, the sum of profits and consumer surplus, equals $\alpha V_H + (1 - \alpha)V_L - \alpha T$.

The next section shows that combining pull and push does even better.

4. Adding Push to Pull Improves Channel Price Coordination

In contrast to pure pull, in this section the manufacturer may both pull and push. In our static model push refers to a long-run reduction in wholesale price designed to complement the pull and to induce the retailer permanently to sell to the low willingness-to-pay consumers. The following result holds.

Result 4. The manufacturer can increase the probability of channel price coordination by supporting pull with push.

To find the general conditions under which channel price coordination will be enhanced by a combination of pull and push, we first must find the optimal pull discount. This depends on the Highs' transaction cost of discount use, T. Two cases could be studied, small and large transaction costs. Here the case in which it is small, $T < V_H - V_L$, is analyzed. The case of larger transaction costs, $T \geq V_H - V_L$, is similar to that of footnote 6.

With small transaction costs, the profit-maximizing manufacturer will pick a pull discount equal to the Highs' transaction cost,

$$D^* = T. \tag{11}$$

See the Appendix for a proof. Given this discount, the highest retail price that induces all customers to buy the product is

$$P_r^* = V_L + T. \tag{12}$$

To find the equilibrium wholesale price, note that retail profit equals $V_L + T - P_w$ when the retailer acts cooperatively. The retail price that maximizes the retailer's profit when he threatens to sell only to the Highs is V_H, and the resulting retail profit equals $\alpha(V_H - P_w)$. To induce retail sales to the Lows, the manufacturer offers the discount given in (11) and adjusts the wholesale price until the retailer is just indifferent between

[7] Targeted pull makes the net willingness-to-pay of the Highs approach that of the Lows. The same logic applies if the Lows have positive transaction costs, T_L, as long as these costs are sufficiently low relative to those of the Highs (specifically, when $T_L < \alpha T$). However, as the transaction costs of the Lows grow, the gap between the two segments' willingness-to-pay shrinks, so pull becomes less effective in motivating channel coordination and total channel profits, $V_L - T_L$, decrease.

selling to all customers and selling only to the Highs. Setting the two retail profit expressions equal and solving for the wholesale price gives

$$P_w^* = V_H - (V_H - V_L - T)/(1 - \alpha). \tag{13}$$

Recall that if the manufacturer wanted to sell only to the Highs, the wholesale price would equal to V_H. As a result, pricing by the manufacturer involves a push as well as a pull. The retailer is offered a price reduction of the amount $(V_H - V_L - T)/(1 - \alpha)$, whereas the consumers are offered a discount of T.

Using equations (11) and (13), and keeping in mind both that the retail price is $V_L + T$ and that the discount is paid only to the Lows, the manufacturer and retailer's profits are

$$\pi_m^* = P_w^* - (1 - \alpha)T = [V_L - \alpha V_H + \alpha(2 - \alpha)T]/(1 - \alpha) \quad \text{and} \tag{14}$$

$$\pi_r^* = V_L + T - P_w^* = [\alpha(V_H - V_L) - \alpha T]/(1 - \alpha). \tag{15}$$

The channel profit is $V_L + \alpha T$.

A vertically integrated channel that price discriminates using a pull discount can sell to the Lows at their willingness-to-pay V_L and to the Highs at $V_L + T$, for a total profit of $V_L + \alpha T$. When $\alpha V_H < V_L + \alpha T$ this is more profitable than selling only to the Highs. In Figure 5 all parameter values above line A satisfy this inequality. If an independent channel does not use pull, it would include Lows in the market only when $\alpha V_H < V_L$, which defines line B in Figure 5. Between lines A and B, without pull, the independent channel misses a profitable opportunity to sell to Lows.

The independent manufacturer benefits from a pull-push strategy as long as profit (14) exceeds profits obtained when selling only to the Highs without discounts, αV_H. Therefore, the manufacturer can profitably use pull when $\alpha V_H(2 - \alpha) - \alpha T(2 - \alpha) < V_L$, which defines line C in Figure 5. The hatched area between lines B and C depicts

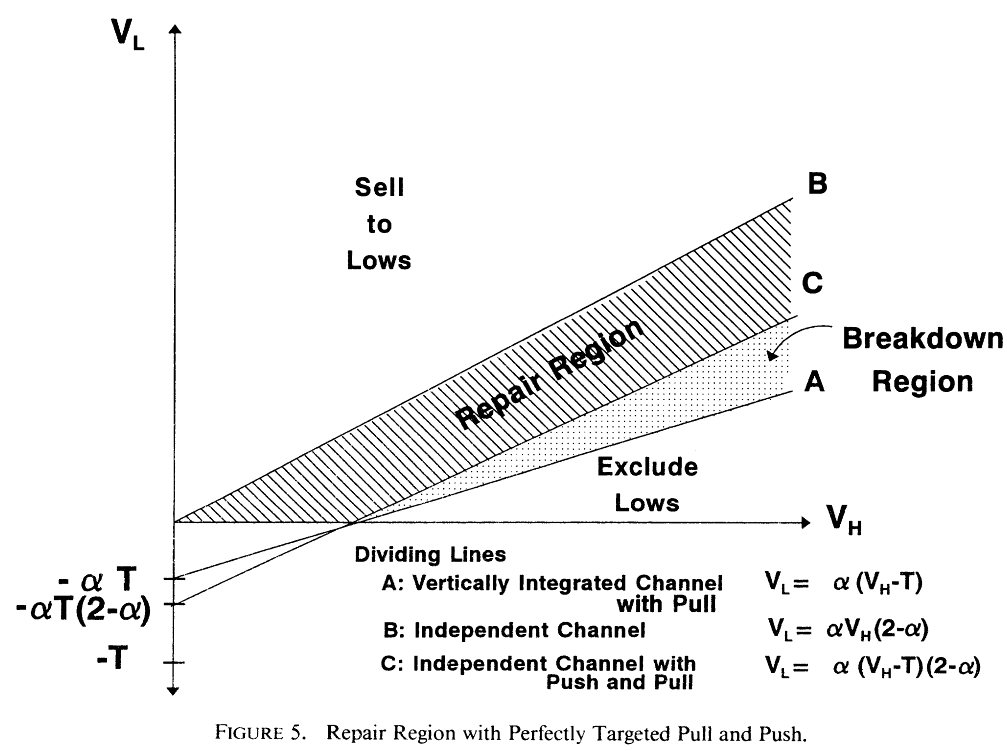

FIGURE 5. Repair Region with Perfectly Targeted Pull and Push.

the repair region consisting of parameter values where pull corrects the problem of double marginalization. The independent channel's pull-push strategy fails to repair the breakdown in channel price coordination when

$$\alpha(V_H - T) < V_L < \alpha V_H(2 - \alpha) - \alpha T(2 - \alpha). \tag{16}$$

Price discriminatory pull is neither necessary nor sufficient to solve the channel coordination problem of double marginalization. Section 3 showed it is not necessary, and Figure 5 illustrates that a breakdown region remains even with price discrimination.

Both Figure 4 and Figure 5 describe the contingent behavior of the channel, contingent on the demand conditions. Figure 5 differs from Figure 4 only in that the constraint "no price discrimination" has been lifted. Comparison of the two figures highlights the fact that in a wider range of demand contingencies the channel will act in a coordinated fashion when the manufacturer uses all its tools (push and pull).

Explicitly, the repair region for pull-push in Figure 5 is larger than that for pure pull in Figure 4 for two reasons. First, when the independent channel does not use pull, it forgoes the opportunity to price discriminate. Second, without pull it runs into the problem of double marginalization and price coordination breaks down.

As a minimum requirement for the pull-push strategy to be effective in repairing channel breakdown in price coordination, T must be large enough to satisfy,

$$T > V_H - \frac{V_L}{\alpha(2 - \alpha)}. \tag{17}$$

In Figure 5 the lower boundary of the repair region, $V_L = \alpha V_H(2 - \alpha) - \alpha T(2 - \alpha)$, shifts downward as T increases, and the repair region enlarges. That is, a combination of push and pull strategy is more likely to improve channel coordination when the transaction costs differential between the consumer segments is larger. A pull and push combination works better in repairing a breakdown in channel price coordination if the manufacturer can design the pull such that the transaction cost differential between the Highs and Lows, T, is larger.

The pull discount extracts all the consumer surplus of the Lows, but the Highs obtain a positive surplus of $V_H - P_r = V_H - V_L - T$. Total welfare equals $\alpha V_H + (1 - \alpha)V_L$ and this exceeds that of pure pull because the discount is not used by the Highs, saving society their transaction cost.

5. Targeted Pull: Theory Versus Evidence

Recent evidence indicates that many pull discounts, such as manufacturer coupons, increase sales significantly but are used heavily by customers who would have bought the brand regardless. A national brand manager used to calibrate Neslin and Shoemaker's (1983) coupon model estimated that 50% of the coupon users would have chosen the brand without a coupon. Shoemaker and Tibrewala (1985) found that half the coupon users had been buying other brands recently. About half of survey respondents in Neslin and Clarke (1987) stated they use coupons to buy brands that they normally would not purchase. Finally, Neslin (1990) estimated that 44% of coupon usage was incremental sales that otherwise would not have occurred.

To this point we have assumed perfect targeting of the pull discount. Specifically, the customers who are least likely to buy the brand ceteris paribus have zero transaction costs for using the discount while the customers who are most likely to buy the brand have positive transaction costs. This assumption does not imply that all discount sales are incremental; in Section 3 we saw that a fraction α of the discount sales would have occurred without the pure pull discount.

In Section 4, however, when the manufacturer both pushes and pulls, all discount sales were incremental. This is because the homogeneous High segment avoided the pull discount to save transaction costs. The above empirical evidence suggests that such perfect targeting is unlikely.

Fortunately, this is a result of our expositional assumptions, not the model itself. Even when the majority of discount users would have bought the product anyway (and at a higher price), pull can still profitably repair channel price breakdown. More formally,

Result 5. Imperfectly targeted pull can repair channel breakdown, even if the majority of discount users would have bought the product without it, but repair is more likely and effective when the pull is more accurately targeted.

To show this, some heterogeneity in Highs' transaction costs is needed. Since Highs would buy the brand anyway, suppose that some of them can avoid the transaction cost of brand switching.

To model this imperfect targeting[8] of customers, suppose that a proportion, ρ, of the Highs has zero transaction costs of using the pull discount. Call these customers the deal-prone Highs. When a pull discount is offered to bring the Lows into the market, these deal prone Highs use the discount, too. The remainder of the Highs, $1 - \rho$, have positive transaction costs, T, and will not use the discount, just as before. Since this model is a continuous generalization of the previous one (previously, $\rho = 0$), it is obvious that for small numbers of deal-prone Highs pull can still repair channel breakdown (see Appendix).

As ρ increases, the percent of discount sales that are incremental diminishes since the pool of discount customers becomes richer with Highs. The manufacturer sells to the deal prone Highs at a discounted price although they would have bought at the regular price. As shown in Table 1, even when more Highs use the pull discount than Lows (incremental sales per discount are less than 50%), pull is profitable because it repairs the double marginalization. (Gerstner and Holthausen (1986) also show that leakage can be substantial for profitable promotions.)

Even though imperfectly targeted pull may achieve some success in coordinating channel pricing, we want to emphasize that a positive correlation between willingness-to-pay (price insensitivity) and the transaction costs of using the discount is crucial for this strategy to work. If the pull discount is not carefully targeted to price-conscious consumers, it can lead to undesirable results. In many cases, targeting is beyond the control of the manufacturer. In other cases, improvements may be made.

Trans World Airlines, for example, once offered 25% discount coupons to customers who would buy Polaroid cameras or film. The object of this pull strategy was to entice vacation travelers (price-conscious customers) to increase travel. However, travel agencies bought thousands of cameras, which enabled them to offer lower prices to corporate clients as well. A TWA vice-president later admitted that ". . . in hindsight it appeared the airline should have put more restrictions on the coupons" (*News and Observer* 1985).

In contrast, consider the case of Catalina Marketing. Most manufacturers distribute coupons through freestanding newspaper inserts. These may not be targeted carefully. Recent developments in technology, however, enable some sellers to target discounts selectively in increasingly cost-effective ways. Catalina Marketing installed systems in more than 4,200 supermarket checkout stands nationwide that evaluate scanner data, match it with programmed manufacturer promotions, and print coupons that are handed

[8] Perfect targeting means the pull discount is distributed just to the Lows and imperfect targeting means that some of the discounts fall in the hands of the Highs. The manufacturer may have the ability to perfectly target a pull but be forced by channel coordination problems to offer such a large discount that it does not price discriminate; this was the case when push was not allowed (Section 2).

TABLE 1

Pull Discount Sales with Leakage

Highs that Leak, ρ (percent)	Incremental Sales per Discount Purchase (percent)	Manufacturer Profits	Retail Profits	Channel Profits
40	62	7.4	0.8	8.2
50	57	7.0	1.1	8.1
60	53	6.6	1.4	8.0
70	49	6.0	1.8	7.8
80	Breakdown	6.0	0.0	6.0
90	Breakdown	6.0	0.0	6.0
100	Breakdown	6.0	0.0	6.0

$V_H = 10$, $V_L = 7.5$, $T = 2$, $\alpha = 0.6$.

directly to targeted consumers based on their product purchases of competing products or complementary products. Another illustration is FreeFone, a new telephone service tested in Seattle (*Forbes* January 1994). Each time a FreeFone member makes a call, the communication system decides whether they fit the segment profile for a targeted telemarketing promotion. FreeFone compensates members for the promotional exposures.

Since this theory gives a new, but not the sole justification for pull promotions, we ought to ask what empirical implications it provides and whether these implications are unique? Consider the following.

Suppose that the manufacturer has been regularly using a pull promotion. If the consumer population changes so that the dollar value of the pull discount increases, then retail profits fall (as T increases, D goes up, but retail profits go down). Moreover, larger pull discounts should be correlated positively with higher retail prices (see equations 11 and 12). Finally, larger discounts should be negatively correlated with retail gross margin percentages. To see this, compute retail margin as a percentage of the retail price; divide equation (15) by equation (12) and using equation (11):

$$\text{Retail Margin Percent} = \frac{\pi_r^*}{P_r^*} = \frac{\alpha}{1-\alpha}\left(\frac{V_H}{V_L + D^*} - 1\right). \tag{18}$$

The intuition behind these results is as follows. Higher transaction costs allow the manufacturer to raise the pull discount and still separate the segments. The larger discount also allows the retailer to raise the shelf price, but doing this reduces the potency of his threat to sell only to the Highs (because the distance between $V_L + T$ and V_H shrinks). The less potent threat in turn allows the manufacturer to raise the wholesale price and the retail margin percentage falls.

Recent empirical work on the relationship between manufacturer coupons, retail gross margin percentages, and retail prices support these conclusions. Studying more than 1,100 coupons dropped in ten U.S. cities, Gerstner, Hess, and Holthausen (1994) find the elasticity of coupon face value with respect to retail markup percentage to be −0.6 and the elasticity of coupon value with respect to retail price to be +0.5, exactly as predicted above.

6. Retail Pull and Quota-Based Push

The above analysis of pull strategy assumes that the manufacturer takes leadership in the attempt to solve the channel price coordination problem through pull. The manufacturer used pull in various ways, and the retailer reacted to this initiative by setting the most profitable retail price. What if the retailer can also use consumer promotions, such as retail coupons, of his own? Can this enhance channel price coordination, too?

How will it affect channel members' profits? The answer depends on whether the manufacturer was originally using pure pull or push-pull combination, as shown next.

If the retailer bears the cost of redeeming the pull discount, he chooses the discriminatory discount, $D = T$. Revenue of $V_L + T$ is collected from all consumers and a total of $(1 - \alpha)T$ dollars in pull discounts is paid to the Lows. Retail profits equal $V_L + \alpha T - P_w$. If the retailer decides to not issue the pull discounts and to sell only to Highs, then the retail profit is $\alpha(V_H - P_w)$. To motivate the retailer to use pull, the manufacturer must choose the wholesale price to equate these two profits:

$$P_w^* = (V_L - \alpha V_H + \alpha T)/(1 - \alpha). \tag{19}$$

The profits of the manufacturer and retailer are

$$\pi_m^* = P_w^* = [V_L - \alpha V_H + \alpha T]/(1 - \alpha) \quad \text{and} \tag{20}$$

$$\pi_r^* = \alpha[V_H - V_L - \alpha T]/(1 - \alpha). \tag{21}$$

Comparing equation (20) to equation (8), we see that a manufacturer who uses pure pull is not affected by retail consumer promotions. Because there is no change in the breakdown or repair regions, retail promotions do not have any impact on the probability of channel coordination. That is, if the manufacturer lets the retailer pay for pull discounts and switches to pure push, there will be neither amelioration nor deterioration in channel coordination.

What if the manufacturer is using pull and push, and then the retailer starts to pull? Comparing equation (20) to equation (14), we see that the retail pull diminishes manufacturer profits. Unlike the previous case, here the manufacturer is giving up control of the pull discount when push is already being used by him. Therefore the pull creates a new channel conflict on who should offer the promotion.

How will such conflict be resolved? Will the manufacturer and retailer share the pull in equilibrium? For example, supermarkets that double manufacturer coupons actually offer a retail coupon that is exactly equal to the manufacturer coupon (Hess and Gerstner 1993). Analysis of this intriguing case is left for future research.

Finally, the manufacturer can achieve price coordination by using push alone if it is "quota-based." That is, the manufacturer offers a wholesale price discounts only if the retailer achieves a certain sales quota. Such a quantity dependent push can prevent channel pricing breakdowns caused by double-marginalization because the quotas motivate the retailer to increase sales (Dolan 1987).

Consider the numerical example of Section 2. The manufacturer might set a quota of $\alpha = 0.5$, and the retailer is offered a wholesale price reduction from \$3 to \$2 if the sales exceed this quota. To qualify the retailer must reduce the price to \$2 and sell to the Lows. Of course, the retailer gets zero economic profits in either case, but recall the tie-breaking assumption. A slight reduction in the discounted wholesale price below \$2 will convince the retailer to cooperate. The manufacturer gets a profit of \$2 with the quota-based push versus \$1.50 without. This quantity-dependent push system prevents channel breakdown.

However, to monitor such quota-based systems the manufacturer must measure retail sales through "bill-backs" (where the retailer bills the manufacturer for the units sold to consumers during the promotional period) or through a "count-recount" procedure (where stock is taken at the beginning and at the end of the period; see Blattberg and Neslin 1990, page 418). Our static model does not allow us to address dynamic issues of forward buying or diversion (see Armstrong, Bass, and Rao 1993, Armstrong and Buss 1993, Gupta 1992 for dynamic models of forward buying). Retailers do not like these quantity discount systems because of the time and effort required, but as demonstrated by Jeuland and Shugan (1983) and here, they are attractive when channel coordination is a serious problem.

TABLE 2
Pull, Channel Profits and Welfare

Channel Situation	Manufacturer's Profit	Retailer's Profit	Channel Profit	Consumer Surplus	Social Welfare
Breakdown	Low	Zero	Low	Zero	Low
Pure Pull	Average	Low	Average	Average	Average
Imperfectly Targeted Pull	High	Very Low	High	High	High
Pull/Push	Very High	Very Low	Very High	Average	High

7. Conclusion

We recommend that manufacturers consider pull price promotion as a coordination tool in an independent channel. Previous research has shown that pull discounts induce product trial, attract brand switchers, enhance repeat purchases, motivate the sales force, increase category consumption, and reinforce advertising (Blattberg and Neslin 1990). In contrast, our research highlights a dimension of pull not studied before.

The intuition behind the paper is as follows. Targeted pull discounts reduce the difference in willingness-to-pay between the two segments because it imposes transaction costs on consumers in an asymmetric fashion; the targeted pull discount is more accessible to the price conscious consumers, and more difficult to use for the nontargeted segment. The transaction cost differential created between the nontargeted and targeted consumers makes the demand faced by the retailer more elastic. The more elastic demand makes price reductions more profitable for the retailer, so he is more willing to cooperate and sell to the price-conscious segment.

The strategy is more likely to work when the pull discount is distributed in a way that makes it easy to use for price-conscious consumers and hard to use for consumers who would buy the product even without the discount. Supporting the pull with push increases the effectiveness of the pull even farther. Table 2 summarizes the results of the paper.[9]

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[9] This paper was received February 8, 1993, and has been with authors 3 months for 3 revisions. Processed by Scott Neslin, Area Editor.

Appendix

Proof of Equation (11). If the pull discount is larger than the Highs' transaction cost, $D > T$, then the Highs use the discount. Channel cooperation requires the manufacturer to set the wholesale price so that all customers pay an after-discount price V_L. That is, the retail price must be $V_L + D$. However, this D does not maximize the manufacturer's profit for the following reason. The pull discount and wholesale price may be reduced by the same small amounts, making the retailer better off because the pull discount is paid by the manufacturer. The manufacturer's profit is unaffected by equal reductions in wholesale price and pull discount, because all consumers use the discount. This adjustment continues until the discount equals the transaction cost of the Highs, $D = T$. At this point the manufacturer realizes a large increase in profits because the Highs stop using the discount. They still buy the product, without the discount, because $T < V_H - V_L$ (their willingness-to-pay, V_H, exceeds the retail price $V_L + T$). In summary, $D > T$ does not maximize the manufacturer's profit.

Assume now that the discount is smaller than the Highs' transaction costs, $D < T$. This implies the following: (a) Highs do not use the pull discount, (b) the retail price under retailer cooperation, $V_L + D$, is below V_H (because $D < T < V_H - V_L$ by assumption), and (c) retail profit, $V_L + D - P_w$, is unaffected if the pull discount and wholesale price are increased by the same amount. Suppose that D and P_w are increased in equal amounts. A small increase in the discount does not induce the Highs to redeem it, but it does result in a slightly higher retail price, $V_L + D$. The Highs still buy the product at the marginally higher retail price because it is below their reservation price. Lows also buy the product because the after-discount price is still V_L. How will an equal increase in pull discount and wholesale price improve the manufacturer's profit? The higher wholesale price contributes additional revenues from all units sold, but the higher discount is paid only to the Lows. That is, $D < T$ does not maximize manufacturer profit. When $D = T$, following the standard tie-breaking assumption, we assume that Highs do not use the discount. In conclusion, the profit-maximizing pull discount equals the Highs' transaction cost as shown in (11).

Proof of Result 5. Because some Highs use the pull discount, the retailer has two pricing options if he wants to sell only to the Highs. As before, he can set a price equal to V_H and sell to all the Highs, but now the retailer can also choose a retail price of $V_H + D$, restricting sales just to the $\alpha\rho$ deal-prone Highs with zero transaction costs.

The wholesale price in equation (13) was set only to prevent the first option. The manufacturer can prevent the second option by setting the wholesale price low enough that the retailer's profits from cooperating and selling to all customers, $V_L + T - P_w$, exceeds his profit from higher margins and lower sales, $\alpha\rho(V_H + T - P_w)$. Equalizing these two expressions and solving for the wholesale price gives

$$P_w^{**} = V_H - \frac{V_H - V_L - (1 - \alpha\rho)T}{1 - \alpha\rho}. \tag{22}$$

To assure channel coordination, the manufacturer obviously will have to offer the lower of the two wholesale prices (13) and (22). A condition that guarantees that (22) is smaller than (13) is

$$\rho > 1 - \frac{(1 - \alpha)T}{V_H - V_L - \alpha T}. \tag{23}$$

Assume that inequality (23) is satisfied, so pull targeting is relatively inaccurate.

With the wholesale price at the level given in equation (22), the retailer will cooperate by reducing the retail price enough to bring the Lows into the market. The pull discount, $D^{**} = T$, will be used by all the Lows and part of the Highs ($1 - \alpha + \alpha\rho$ in total), and the manufacturer's profit equals

$$\pi_m^{**} = P_w^{**} - (1 - \alpha + \alpha\rho)T = [V_L - \alpha\rho V_H + \alpha(1 - \alpha\rho)(1 - \rho)T]/(1 - \alpha\rho). \tag{24}$$

The retailer's profit is

$$\pi_r^{**} = \frac{\alpha\rho}{1 - \alpha\rho}(V_H - V_L), \tag{25}$$

and total channel profit is $V_L + \alpha T - \alpha\rho T$.

Following the same reasoning that lead to inequality (16), imperfectly targeted pull fails to repair the channel price breakdown when

$$\alpha V_H < V_L < \alpha V_H(1 + \rho(1 - \alpha)) - \alpha(1 - \alpha\rho)(1 - \rho)T. \tag{26}$$

This implies that a channel breakdown is repaired by imperfectly targeted pull if

$$\alpha V_H < \alpha V_H(1 + \rho(1 - \alpha)) - \alpha(1 - \alpha\rho)(1 - \rho)T < V_L < \alpha V_H(2 - \alpha). \tag{27}$$

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