Chapter 2
Coordination in Marketing Channels

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Introduction
Channels of distribution are complex institutional arrangements the functioning of which is of utmost interest to marketing decision makers and researchers. Casual observation of retail prices indicates that there is a large difference between producer prices and retail prices, thus raising the question of productivity of marketing and more specifically of efficiency of channels of distribution. Indeed, retail prices are the result of a series of markup or margin decisions by manufacturers, wholesalers, and retailers, who operate in a competitive environment. How these decisions are made is not yet totally understood. The title of a recent Wall Street Journal article, “Pricing of Products Is Still an Art, Often Having Little Link to Costs” (our emphasis), by Jeffrey H. Birnbaum (1981) seems to call for a more systematic approach to pricing decisions. Birnbaum writes:

On many goods, retailers first set prices merely by more or less doubling the price they pay wholesale. If the goods don’t sell at that price, the retailers mark them down. Proctor-Silex and other manufacturers are legally prohibited from fixing retail prices, but they do set their wholesale prices with an eye toward their retail customers’ pricing policies.

As Birnbaum suggests, members of a channel of distribution cannot but be aware of the interdependencies between their respective profit functions, and consequently they do not make their decisions in isolation, i.e., without considering the reactions of the other channel members.

Jeuland and Shugan (1981, cf. Shugan and Jeuland 1981) have recently investigated the issue of coordination in channels of distribution. In their first paper, “Managing Channel Profits,” they postulate a simple model of the two-member channel, i.e., one manufacturer and one retailer. They demonstrate the effect of a lack of coordination of marketing mix decisions, for example, product quality,
advertising, pricing, and shelf space. They then review mechanisms of coordination and promote profit sharing as one mechanism that has many desirable properties. In their second paper, "Implicit Understandings in Channels of Distribution," they investigate whether coordination may exist without an explicit procedure. In the next section we review key results obtained in these two papers. The following section will discuss these results further and deal with extensions and future research.

**Coordination in the Simple Two-Member Channel**

Figure 2.1 illustrates a simple channel with one manufacturer and one retailer. If \( p \) denotes the retail price and \( D(p) \) is the consumer demand that the retailer faces, the profit functions of the manufacturer and retailer, respectively, can be defined as

\[
\Pi = GD - F = (t - C)D - F, \quad (1)
\]

\[
\pi = gD - f = (p - t - c)D - f, \quad (2)
\]

where \( G \) is the manufacturer's margin and is equal to the price \( t \) charged to the retailer minus his own variable cost \( C \). The retailer's margin \( g \) equals the retail price \( p \) minus the retailer's variable costs \( t + c \). \( F \) and \( f \) are the fixed costs of the manufacturer and the retailer. The above definitions indicate that \( p = G + g + C + c \). Consequently, the retail price \( p \) is the result of the margin decisions made by the channel members.

If the manufacturer and the retailer act independently and are profit maximizers, they each select their margins \( G \) and \( g \) such that \( \partial \Pi / \partial G = 0 \) and \( \partial \pi / \partial g = 0 \). Because \( p = G + g + C + c \), \( \partial \Pi / \partial G = G(dD/dp)(dp/dG) + D = G(dD/dp) + D = 0 \) and \( \partial \pi / \partial g = g(dD/dp) + D = 0 \). The solution \( G^{**} = g^{**} \) to the system

\[
GD' + D = 0, \quad (3)
\]

\[
gD' + D = 0. \quad (4)
\]

is the Cournot–Nash equilibrium of the channel. If, instead of acting independently, both channel members perfectly coordinate their actions so that total channel profits are maximized, then

\[
\frac{d(\Pi + \pi)}{dp} = \frac{d}{dp} [(p - C - c)D - F - f] = (p - C - c)D' + D
\]

\[= (G + g)D' + D = 0. \quad (5)
\]

A direct implication of the Cournot–Nash equilibrium is that \((G + g)D' + 2D\)

\[^1\text{Constant marginal costs } C \text{ and } c \text{ are assumed.}
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= 0. After rewriting, one obtains

\[(G + g)D' + D = -D.\]  \hspace{1cm} (6)

This shows that, at the Cournot-Nash equilibrium, \(d/dp(H + IT) = -D < 0\) so that the equilibrium price \(p^{**} = G^{**} + g^{**} + C + c\) is higher than the optimal price \(p^*\) that maximizes total channel profits. Figure 2.2 illustrates condition (6).

If we now observe the channel at the optimal price \(p^*\), i.e., the price that maximizes total channel profits, equation (5) implies

\[GD' + D = \partial\Pi/\partial G = -gD' > 0\]  \hspace{1cm} (7)

since \(D\) is a downward sloping demand function and \(D' = dD/dp < 0\). Similarly, (5) implies

\[gD' + D = \partial\pi/\partial g = -GD' > 0.\]  \hspace{1cm} (8)

Consequently, whatever division of optimal channel profits is arrived at by the manufacturer and retailer (the division is defined by \(G^*\) and \(g^*\) such that \(G^* + g^* = p^* - C - c\)), both channel members have an incentive to increase their

Figure 2.1 Manufacturer–retailer channel of distribution.

Figure 2.2 Total channel profits as a function of price.
A. P. Jeuland and S. M. Shugan

margin in the short run. The optimal price $p^*$ is not stable as a result. In sum, the results obtained by Jeuland and Shugan (1981) indicate that there is an economic incentive to channel coordination in the sense that when each partner independently maximizes his own profit, the resulting channel equilibrium leads to a price higher than the price that maximizes the sum of the profits. On the other hand, at the optimal channel price $p^*$, each partner can unilaterally increase his margin and gain short-term profits at the expense of the other partner. This unilateral action also causes a decline in total channel profits. If the retailer increases his margin from $g^* = p^* - G^* - C - c$ to $g^* + \Delta g$, his gross profits $gD$ become

$$gD = g^*D^* + \Delta g(D^* + g^*D''*) + \frac{(\Delta g)^2}{2} (2D^* + g^*D''*) + O_1(\Delta g^2),$$

and the manufacturer’s gross profits become

$$G^*D = G^*D^* + \Delta gG^*D'^* + \frac{(\Delta g)^2}{2} G^*D''* + O_1(\Delta g^2).$$

Because, at $p^*$, total channel profits are maximized, $D^* + g^*D^* = -G^*D^* > 0$ and also $d^2(\Pi^* + \pi^*)/dp^2 < 0$; i.e., $2D^* + (G^* + g^*)D''* < 0$. Then

$$\Delta(gD) = gD - g^*D^* = -\Delta gG^*D'^* + \frac{(\Delta g)^2}{2} (2D^* + g^*D''*)$$

and

$$\Delta(G^*D) = G^*D - GD = \Delta gG^*D'^* + \frac{(\Delta g)^2}{2} (G^*D''*) + O_1(\Delta g^2)$$

so that $\Delta(gD) > 0$ and $\Delta(G^*D) < 0$. The net effect is

$$\Delta(gD) + \Delta(G^*D) \sim \Delta(g)^2 [2D^* + (g^* + G^*)D''*] < 0.$$

Jeuland and Shugan (1981) also study other marketing mix variables. For example, if demand is a function not only of price but also of product advertising done by the manufacturer and of shelf space allocated by the retailer, then an extension of the above model is

$$\Pi = GD(p, Q, s) - Q - F, \quad (9)$$

$$\pi = gD(p, Q, s) - s - f, \quad (10)$$

where $Q$ and $s$ denote opportunity costs of national advertising and shelf space,

\[ D^* = D(p^*), D'^* = dD/dp\big|_{p^*}, D''* = d^2D/dp^2\big|_{p^*}, O_1(\Delta g^2) \text{ is a small residual term of order higher than } \Delta g^2.\]

\[ O_2(\Delta g^2) \text{ is another small residual term of order higher than } \Delta g^2.\]
respectively. Again, independent channel partners would make their respective decisions \((G, Q)\) and \((g, s)\) such that the following conditions hold: For the manufacturer,

\[
\frac{\partial \Pi}{\partial Q} = G \frac{\partial D}{\partial Q} - 1 = 0, \tag{11}
\]

\[
\frac{\partial \Pi}{\partial G} = G \frac{\partial D}{\partial G} + D = 0; \tag{12}
\]

and for the retailer,

\[
\frac{\partial \pi}{\partial s} = g \frac{\partial D}{\partial s} - 1 = 0, \tag{13}
\]

\[
\frac{\partial \pi}{\partial g} = g \frac{\partial D}{\partial g} + D = 0. \tag{14}
\]

If perfect coordination were achieved, the following conditions would hold:

\[
\frac{\partial (\Pi + \pi)}{\partial Q} = (G + g) \frac{\partial D}{\partial Q} - 1 = 0, \tag{15}
\]

\[
\frac{\partial (\Pi + \pi)}{\partial s} = (G + g) \frac{\partial D}{\partial s} - 1 = 0, \tag{16}
\]

\[
\frac{\partial (\Pi + \pi)}{\partial p} = (G + g) \frac{\partial D}{\partial p} + D = 0. \tag{17}
\]

The equilibrium conditions (11)-(14) show that at the Cournot-Nash equilibrium point

\[
\frac{\partial (\Pi + \pi)}{\partial Q} = \frac{\partial \Pi}{\partial Q} + g \frac{\partial D}{\partial Q} = g \frac{\partial D}{\partial Q} > 0 \quad \text{since} \quad \frac{\partial D}{\partial Q} > 0,
\]

\[
\frac{\partial (\Pi + \pi)}{\partial s} = \frac{\partial \pi}{\partial s} + G \frac{\partial D}{\partial s} = G \frac{\partial D}{\partial s} > 0 \quad \text{since} \quad \frac{\partial D}{\partial s} > 0,
\]

\[
\frac{\partial (\Pi + \pi)}{\partial p} = \frac{\partial \Pi}{\partial G} + \frac{\partial \pi}{\partial g} - D = -D < 0.
\]

Consequently, at the Cournot-Nash equilibrium point, advertising expenditures are too low, shelf-space allocation is too low, and retail price is too high. In addition, if the channel were at the optimal point defined by conditions (15)-(17), the manufacturer and the retailer could increase their profit in the short term by unilaterally increasing their margins or decreasing advertising or shelf space. This is easily seen by rewriting equations (15)-(17) as follows:

\[
\frac{\partial \Pi}{\partial Q} = G \frac{\partial D}{\partial Q} - 1 = (G + g) \frac{\partial D}{\partial Q} - 1 - g \frac{\partial D}{\partial Q} = -g \frac{\partial D}{\partial Q} < 0,
\]
The results clearly indicate that there is an economic incentive for the two channel partners to coordinate their decisions: Total profits are increased when total channel profits are maximized instead of manufacturer profits and retailer profits being independently maximized. However, the point where joint profits are maximized is not stable. At any point where total channel profits are superior to the Cournot-Nash equilibrium profits (sum of manufacturer and retailer profits), at least one partner can, in the short term, increase his profits by unilaterally modifying his decision mix. This increase is at the expense of the other partner and of total channel profits.

Given the benefits of coordination, one would then expect that some institutional arrangements in channels of distribution might be coordination mechanisms. Vertical integration, by replacing the multiple objective functions of channel members by the joint owner's single objective function, in effect eliminates the coordination problem. However, vertical integration may replace one problem—coordination—by another—multiple expertise. The joint owner of a channel may not have the manufacturing expertise and retailing expertise to manage all channel functions efficiently. Formally, the variable costs $C$ and $c$ may be larger when there is a single decision maker than when there are two specialized decision makers. In addition, there are legal constraints on vertical integration. Instead of vertically integrating, channel members may enter into a contract. For example, the manufacturer and retailer may sign an agreement denoted $(G^*, Q^*, g^*, s^*)$ that specifies the manufacturer's margin $G^*$ and his advertising effort $Q^*$ and the retailer's margin $g^*$ and the shelf space $s^*$ allocated to the product. Contracts are indeed very common between business partners. It is obvious, however, that a contract like $(G^*, Q^*, g^*, s^*)$ is not a flexible business arrangement. If, for example, the manufacturer encounters a short-term production problem and cannot deliver all the goods that the retailer would sell at $p^* = C + G^* + c + g^*$, in accord with the contract, then the contractual arrangement is in effect violated. Consequently, there is some question concerning whether simple contracts of the form just described may be enduring arrangements.

For this reason, Jeuland and Shugan (1981) searched for a more flexible mechanism that leads to channel member cooperation. Profit sharing would seem to be a natural starting point to address this question. Jeuland and Shugan (1981) show that with a mechanism that would create a linkage among manufacturer profits, retailer profits, and total profits such that any two profit functions are linearly related, then necessarily, when one profit function is maximized, the other two also are. Given this linkage, there would no longer be a conflict between channel
members' decisions. This raises the next question, namely, how to implement profit sharing. In order to find an answer, let us first define the linkage in mathematical terms. This leads to

\[
\Pi = k_1[(p - C - c)D - Q - s] + k_2 - F, \quad (18)
\]

\[
\pi = (1 - k_1)[(p - C - c)D - Q - s] - k_2 - f, \quad (19)
\]

where \(0 < k_1 < 1\). The term \((p - C - c)D - Q - s\) corresponds to the gross profits of the channel, i.e., revenues minus variable costs.

Equation (18) can be rewritten in the form of equation (9) to give the definition of manufacturer profits [namely, \(\Pi = (i - c)D - Q - F\)]:

\[
\Pi = \left[k_1 p + (1 - k_1)C - k_1 c + k_2 \frac{D}{D} - C\right] D - k_1 Q - k_1 s - F. \quad (20)
\]

Equation (20) shows that profit sharing can be implemented with a quantity discount schedule mechanism defined by

\[
t(D \mid Q, s) = k_1 p + (1 - k_1)C - k_1 c + k_2 \frac{D}{D} \quad (21)
\]

and two cost sharing mechanisms \(CS_1\) for advertising and shelf space:

\[
CS_1(Q) = (1 - k_1)Q, \quad (22)
\]

\[
CS_2(s) = k_1 s, \quad (23)
\]

respectively. Equation (21) specifies the price per unit that the manufacturer will charge the retailer given a level of effort \(Q\) and \(s\). If the retailer orders more units from the manufacturer, he will have to decrease the retail price \(p\) in order to sell the larger volume. The function \(p(D \mid Q, s)\) specifies such price for an order of size \(D\). One can easily prove that \(dt(D \mid Q, s)/dD < 0\), i.e., that \(t(D \mid Q, s)\) is a quantity discount schedule.\(^4\)

\(^4\)From the implicit definition of \(p(D \mid Q, s)\), i.e., \(D = D(p, Q, s)\) and the property of the demand function \(\partial D/\partial p < 0\), one obtains \(\partial p(D \mid Q, s)/\partial D = 1/(\partial D/\partial p) < 0\). Consequently, if \(k_1 > 0, \partial t(D \mid Q, s)/dD < 0\). If \(k_1 < 0\), one needs a more involved proof [see the proof of Jeuland and Shugan (1981, footnote 11)]. At the channel optimum \((p - C - c) \partial D/\partial p + D = 0\) so that

\[
\Pi^* = k_1 \left(- \frac{D(p^*, Q^*, s^*)}{\partial D/\partial p(p^*, Q^*, s^*)}\right) - k_1(Q^* + s^*) + k_2 - F > 0.
\]

This implies

\[
\frac{dt(D^* \mid Q^*, s^*)}{dD} = k_1 \frac{k_2}{\partial D/\partial p(p^*, Q^*, s^*)} < - \frac{k_1(Q^* + s^*) + F}{(D^*)^2} < 0.
\]

With \(dt(D \mid Q, s)/dD\) continuous, \(dt/dD\) is negative over an interval containing the optimal point \((p^*, Q^*, s^*)\).
Equation (22) specifies that for each dollar of advertising spent by the manufacturer, the retailer spends an amount \((1 - k_i)/k_i\). In other words, if the manufacturer spends \(k_iQ_i\), a total of \(Q\) is spent. The retailer thus contributes \(CS_1(Q) = (1 - k_i)Q\). Equation (23) specifies a similar relationship for shelf space where the roles are reversed. In sum, profit sharing is implemented through a quantity discount schedule \(t(D | Q, s)\) and cost sharing functions \(CS_1(Q)\) and \(CS_2(s)\). Consequently, manufacturer profits are defined as follows:

\[
\Pi = [t(D | Q, s) - C] - D - [Q - CS_1(Q)] - CS_2(s) - F. \tag{24}
\]

One should note that equations (21)–(24) in effect specify a generalized variable contract that can thus be viewed as an extension of the simple fixed contract discussed earlier (and denoted \((G^*, Q^*, g^*, s^*)\)).

Of course, more sophisticated behavior than independent profit maximizing behavior leading to the Cournot-Nash equilibrium could take place. For example, if one of the partners realizes that the other’s decision rule corresponds to equation (3) or (4), then he should be able to use this knowledge to increase his profits. Let us take the example where the manufacturer realizes that the retailer behaves according to \(gD' + D = 0\), where \(D = D(p)\) and \(p = G + g + C + c\). The equation \(gD' + D = 0\) specifies the implicit function \(g = g(G)\). If the manufacturer uses this knowledge, he will maximize his function \(\Pi\) given \(g = g(G)\). This maximization problem is thus defined as

\[
\max G G^2(1 + g') + D = 0. \tag{25}
\]

In the case of constant elasticity demand functions, \(D(p) = Kp^{-\eta}\), equation (4) leads to \(g = (G + C + c)/(\eta - 1)\). Equations (4) and (25), which imply \(G(1 + g') = g,\) lead to \(G[1 + 1/(\eta - 1)] = (G + C + c)/(\eta - 1)\), i.e., \(G = (C + c)/((\eta - 1)^2\) and \(g = (C + c)/(\eta - 1)^2\) versus \(G = g = (C + c)/(\eta - 2)\) for the Cournot-Nash equilibrium. The resulting price is \((\eta - 1)^2(C + c)/(\eta - 2)\) for the Cournot-Nash equilibrium. The price being lower than under Cournot-Nash, joint profits are higher as shown by Shugan and Jeuland (1981). In fact, both partners gain by moving from the Cournot-Nash positions to the follower-leader equilibrium positions just described.

More generally, one can contrast the Cournot model, where each partner takes the other partner’s actions as given, with the Stackelberg model, where one partner takes the other’s reaction as given. Shugan and Jeuland (1981) refer to this type of behavior as “implicit understanding.” If the manufacturer expects the retailer to choose the margin \(g = R(G)\) as a reaction to his margin decision \(G\), then he will determine \(G\) such that \(GD(G + R(G) + C + c)\) is maximized. If only one partner takes expectations \(R(G)\) (or \(r(g)\)) into account and the other assumes \(G\) (or \(g\)) as given, then a solution exists. If both partners have their own expectations and act upon them (i.e., both try to be leaders), the solution is indeterminate. If

\(\eta > 2\) is assumed.
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one specifies rules for updating $R$ and $r$, then specific equilibrium results may be obtained.

Shugan and Jeuland (1981) study the case where

$$R(G_{t+1}) = g_t + \Delta(G_{t+1} - G_t)$$

and

$$r(g_{t+1}) = G_t + \lambda(g_{t+1} - g_t).$$

With the demand function $D(p) = Kp^{-\gamma}$, they show that the following equilibrium results:

$$G = \frac{C + c}{1 + \Lambda \eta - 1/(1 + \Lambda) - 1/(1 + \lambda)} \tag{27}$$

$$g = \frac{C + c}{1 + \lambda \eta - 1/(1 + \Lambda) - 1/(1 + \lambda)} \tag{28}$$

so the equilibrium price is

$$p = \frac{\eta(C + c)}{\eta - 1/(1 + \Lambda) - 1/(1 + \lambda)}. \tag{29}$$

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3 The case $\Lambda = 1/(\eta - 1)$ and $\lambda = 0$ is the leader/follower case described earlier; $\lambda = \Lambda = 0$ is the case of partners who independently maximize their profits. This case leads to the Cournot-Nash equilibrium.

4 Shugan and Jeuland (1981) formulate the profit maximization problem of the two channel members as

$$\max_{G_{t+1}} D[G_{t+1} + R(G_{t+1}) + C + c],$$

$$\max_{g_{t+1}} D[g_{t+1} + r(g_{t+1}) + C + c],$$

which leads to

$$\Omega_{t+1} = M \Omega_t + N(C + c), \tag{26}$$

where

$$\Omega_{t+1} = \begin{pmatrix} E_{t+1} \\ g_{t+1} \end{pmatrix}, \quad M = \begin{pmatrix} -\Lambda & 1 \\ \frac{1}{(1 + \Lambda)(\eta - 1)} & \frac{1}{(1 + \Lambda)(\eta - 1)} - \lambda \end{pmatrix},$$

and

$$N = \begin{pmatrix} 1 \\ \frac{1}{(1 + \Lambda)(\eta - 1)} \end{pmatrix}.$$
In order for this equilibrium to be an optimal channel profit point, the following condition is required:

\[
\frac{1}{1 + \lambda} + \frac{1}{1 + \mu} = 1,
\]

i.e., \(\lambda \mu = 1\). For example, if \(\lambda = \mu = 1\), each partner believes that the other partner would exactly match any increase or decrease that he would initiate.

One should note that, as the channel progresses toward the equilibrium given by equations (27)–(29), the actual reactions will not be equal to the perceived reactions \(R\) and \(r\), so these perceived reactions may be characterized as irrational. Further research is required to define appropriate reaction functions and how they would be updated in disequilibrium situations.

Channel Coordination: Assumptions, Implications, and Further Research

Model Assumptions

It is clear from the preceding analysis that the model considered is rather simple. The assumptions can be categorized into several classes:

1. two-member channel assumptions,
2. certainty assumptions,
3. functional form assumptions,
4. profit specification assumptions, and
5. profit maximization assumptions.

The first set of assumptions relates to the two-member channel. These assumptions include allowing only one retailer and one manufacturer, defining channel profit as the sum of the two individual members' profits, and requiring the final product price to be a function of only the two channel members' decisions. These assumptions are restrictive but can be relaxed. For example, a three-member manufacturer-wholesaler-retailer channel could be studied in the same way the manufacturer-retailer channel was analyzed. Again, we would find that, without some coordinating mechanism, each channel member's margin would be higher than the margin that optimizes total channel profits. We would also find that, without some coordinating mechanism, each channel member's effort would be set at a lower level than the appropriate levels that would optimize total channel profits. Finally, we would again find a higher price and lower channel volume without coordination than we would find with it.

More importantly, this first set of assumptions is very restrictive if we wish to analyze economic systems with multiple manufacturers and retailers. For example, if we have two manufacturers, each producing a different product, and one retailer, carrying both products, the definition of the proper unit of analysis must be carefully addressed. If the two product demands are independent, one could
think of the retailer as participating in two distinct channels—a different channel with each manufacturer. However, if the two products are complementary or substitutable, the profits of these two “channels” are interrelated. Accounting for this interdependency thus requires the notion of a three-member system. New issues relating to competition and product differentiation enter the picture that are totally ignored in the simple vertical two-member system. In fact these phenomena were intentionally ignored in order to emphasize the special bilateral relationships between two channel members. However, the first model is an important first step because only after the coordination problem is well understood in this simple system can one expect to investigate satisfactorily how additional complexity may bring new forms of channel behavior.

The second set of assumptions brings a different type of limitation to the analysis. These assumptions relate to the knowledge possessed by each channel member. For example, it is assumed that each channel member knows the demand curve. It is also assumed that each channel member knows the decisions of the other channel member or can infer those decisions from the resulting product volume. However, this set of assumptions does not imply total certainty. For example, neither channel member knows, with certainty, the other channel member’s decision rules. Moreover, it is not assumed that each channel member possesses the same skills. It is only assumed that each channel member knows the consequence of skilled actions. For example, the manufacturer might know that an adept retailer can generate a 24% increase in sales with particular in-store promotional tools. However, the manufacturer himself might be unable to accomplish the same result with the same promotional tools. This situation might be analogous to a very knowledgeable sportscaster who may know exactly how well an adept athlete should be able to perform particular gymnastic exercises. Nevertheless, the sportscaster may not have the specific knowledge necessary to perform the tasks himself.

The third set of assumptions deals with the introduction of specific function forms. In general, specific forms are avoided. The sections on channel coordination and variable-price contracts assume a general demand function with only the normal downward sloping property. However, the section on implicit understandings and reaction functions does assume a constant-elasticity demand curve in order to explicitly solve for price. This assumption does tend to restrict the generalizability of the subsequent analysis. Nevertheless, the intuition provided by the subsequent analysis does not seem to originate from this particular function. The intuition about implicit understandings seems to originate from assumptions about channel member expectations and the formation of these expectations.

Fourth, we abstract away from many details that might have made the develop-

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9In addition, in order to address the case of multiple products carried by the retailer fully, one must explicitly recognize—beyond the formulation of the opportunity cost variable s—the allocation of effort by the retailer among the several products he carries.
10For example, a linear reaction function can be locally rational for the constant-elasticity demand curve, the linear demand curve, and the exponential demand curve.
opment unnecessarily complex. For example, we do not consider the specific elements of product quality. We also do not model the specific components of the variable cost of the retailer. It is merely assumed that the manufacturer manages product quality as the retailer manages shelf space. As a result many details non-essential to a first analysis are avoided. However, in a later phase of the research, further studies incorporating some of these details become warranted. Several assumptions are associated with the specification of the manufacturer and retailer profit function. Our specification was fairly standard except, perhaps, for our assumption of a constant variable cost of production. We assumed that the manufacturer’s profit is given by \( \Pi = GD - F \) and the retailer’s profit is given by \( \pi = gD - f \). These profit functions assume (1) each channel member faces the same demand function, (2) the retailer does not change the actual product, (3) each channel member would not incur a fixed cost if he were not in business, (4) competition from other products including competitor’s reactions to price changes is already captured by the demand function, and (5) the demand function is only a function of those variables specified in the model.

The fifth and final set of assumptions is referred to as profit maximization assumptions. These assumptions require the manufacturer and the retailer to act as if they are maximizing the previously specified profit functions. However, there are situations when even a profit maximizing entity may not wish to maximize the profits of any given product. It is well known that the decisions necessary to maximize the profits of a product line may not lead to the maximization of profits for every product in that line. Demand or production interdependencies may require the sacrifice of one product’s profits so that another product can yield profits many times the original sacrifice. The result may be a retailer who lowers the price of one product below the profit maximizing price in order to draw into his store additional customers who will, in turn, purchase other products offered by the retailer. Moreover, a manufacturer may lower the price of one product in order to gain production economies on another product. We assume that these problems are not significant or can be incorporated into the demand function. However, in some cases, the assumption of individual-product profit maximization may be suspect. In these cases, it would become necessary to either allow for non-maximizing behavior or to respecify the demand function so profit implications of other products are included.

**Managerial Implications**

Our analysis leads to two direct managerial implications. First, we found that a variable-price contract rather than a fixed-price contract could be the cornerstone of channel coordination. When it is legal to do so, the manufacturer and retailer need only form a variable-price contract with the exact form given in the text. The relative power and skill of each party will be reflected in the negotiation of the constants in that form. However, as long as both channel members start by agreeing to the functional form derived in the text, the outcome will be the attainment of the most profits to divide between them.
Along with its obvious managerial conclusions, our analysis also implies some indirect insights for management. For example, it is now clear that a quantity discount schedule is a good coordination mechanism. However, it is the spirit of the discount schedule and not the actual quantity discount that brings about the coordination. This fact leads us to the conclusion that the quantity discount schedule need not be explicit but only be agreed upon by the channel members. Many frequently occurring channel phenomena may be used to implement the quantity schedule. Bonus packs, rebates, special promotions, promotional allowances, coupons, and other marketing tools can perform the essential functions of cost transference and profit sharing. These activities can be designed in such a way that an implied quantity discount schedule is present. Bonus packs can provide the retailer who sells more units a lower per unit cost, and in-store retail coupons can provide the manufacturer with lower advertising cost. Many alternative promotional devices can be used to implement the spirit of the quantity discount.

Hence, as quantity discounts are a hidden mechanism for achieving coordination, numerous channel phenomena may be hidden quantity discounts. Seemingly, promotional activities that may seem to bring little additional revenue may also be hidden coordination mechanisms. In fact, it is possible for a manufacturer to sell to numerous retailers, offer each retailer a different quantity discount, and still sell to each retailer at the same price. Consider the following example. Let $D(p) = 1000p^{-3}$, $c = 1$, $c_1 = 2$, $c_2 = 4$, and $F = f_1 = f_2 = 0$, where the subscript corresponds to the particular retailer. The profit-sharing quantity discounts for these retailers are given by the following two equations:

$$t_1(D) = k_{11}10D^{-1/3} + (1 - k_{11}) - 2k_{11}k_{21}p_1^3/1000,$$
$$t_2(D) = k_{12}10D^{-1/3} + (1 - k_{12}) - 4k_{12}k_{22}p_2^3/1000,$$

where

- $t_1(D)$ is the price charged to retailer 1 by the manufacturer,
- $t_2(D)$ is the price charged to retailer 2 by the manufacturer,
- $k_{11}$, $k_{21}$ are constants in the agreement between the manufacturer and retailer 1,
- $k_{12}$, $k_{22}$ are constants in the agreement between the manufacturer and retailer 2,
- $p_1$ is the final price charged by retailer 1, and
- $p_2$ is the final price charged by retailer 2.

In this example the optimal price charged to consumers by retailers 1 and 2 is $p_1^* = 4.5$ and $p_2^* = 7.5$, respectively. At these prices the optimal channel volumes will be $D_1^* = D(p_1^*) = 10.97$ and $D_2^* = D(p_2^*) = 2.37$, respectively. Hence

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1For example, national advertising done by the manufacturer and local advertising done by the retailer may be viewed as a way of implementing the cost-sharing functions defined earlier.
$t_1(D^1)$ will equal $t_2(D^2)$ whenever the following condition holds:

\[ 1.5k_{11} + 0.09k_{21} = 2.5k_{12} + 0.42k_{22}. \]

Moreover, if the side payment determined by $k_{21}$ and $k_{22}$ could be made through a nonpricing mechanism (e.g., bonus packs or shared advertising), the $k_{11}$ and $k_{12}$ could be set independently. Each retailer could be charged any of an entire set of prices. However, the first retailer would be charged the same price as the second retailer regardless of the negotiated profit division. Therefore, different quantity discounts do not necessarily imply price discrimination among retailers.

Finally, it is important to realize that the precisely optimal quantity discount schedule need not be implemented in order to show some improvement over the myopic equilibrium. Even the spirit of a quantity discount will often provide some improvement. Channel members need only implement some kind of profit sharing, and the incentives that draw the system profits down to the myopic equilibrium will be partially destroyed.

As far as implicit understandings and reaction functions are concerned, it was shown that when only the manufacturer learns, the retailer gains a greater profit than when neither channel member learns. Moreover, the retailer actually shows a gain over the no-learning situation that is greater than the gain shown by the manufacturer. However, the manufacturer does show some gain over the no-learning situation, but that gain would increase if the retailer were to learn. Hence, not only do both parties have the incentive to learn, but both parties have the incentive to teach. Once either the manufacturer or the retailer realizes the channel coordination problem exists, they each have the incentive to inform the other channel member of the problem.

In this situation, we do not find the smarter channel member exploiting the less smart channel member. Instead, we find the smarter channel member trying to teach the less smart channel member. In other words, the special relationship between the manufacturer and the retailer seems to make them more like partners than competitive entities. Clearly, the bilateral relationship present in channels of distribution is a special relationship not like other relationships found in marketing.

**Extensions**

*Additional variables.* Several extensions can be made in order to improve our analysis. It is possible to introduce additional variables into the quantity discount derivation. For example, other manufacturer decision variables such as national advertising, packaging, and specific components of product quality could be considered. However, we might suspect that the quantity discount schedule will not change dramatically as these variables are introduced. Nevertheless, the improvements in profits resulting from their addition should be examined. Moreover, it would be very interesting to explore the development of implicit understandings involving numerous decision variables.
Relaxation of assumptions. It is also possible to relax some of the assumptions used in our previous analysis. For example, multiple manufacturers might be considered, or multiple retailers might be considered. The analysis might allow for more general demand functions and more general production functions. The effects of price on both primary and selective demand might be used in the analysis. We might also incorporate inventory effects, uncertainty in the demand function, uncertainty in the levels of the decision variables, and uncertainty in the production functions. Symmetric and asymmetric learning by channel partners can take place, and both cases should be studied. The assumption of short-term profit optimization can be relaxed to allow for profit maximization for the entire learning period. Finally, the assumption of profit maximization might be relaxed and replaced with utility maximization incorporating risk attitudes and return on investment.\footnote{A return-on-investment point of view recognizes that the fixed costs $F$ and $f$ are not fixed costs in the long run.}

New settings. Although our analysis has tended to emphasize channel relationships within the traditional manufacturer retailer channel, bilateral relationships do exist in other areas of marketing. For example, the company and its salesforce have a bilateral relationship. The same analysis we performed on the manufacturer--retailer channel could be done on this industrial relationship. Similarly, the company--brand-manager relationship is again a lateral relationship because the brand manager is often evaluated based on the profitability of his brand. Finally, the entire marketing organization might be analyzed in light of the problems in lateral relationships. Different organizational forms (e.g., brand management) could be compared based on their lateral properties.

Empirical Directions
In the last section we examined possible theoretical extensions. However, a number of empirical extensions are also possible. For example, a number of theoretical explanations for quantity discounts have been proposed. Quantity discounts have been viewed as a way of reducing the number of production runs by inducing the retailer to purchase a large quantity of the product directly after a production run. Quantity discounts have been viewed as a method for implementing price discrimination where retailers who order different quantities are required to pay a different price for the product. Quantity discounts have been viewed as a means of shifting inventory costs to distributors with low holding costs. In this case, those channel members with the lower holding costs will purchase the largest quantities of the product and thereby absorb a larger portion of the inventorying responsibilities. Finally, there is the explanation provided by our research: Quantity discounts are a way of coordinating channel members’ decisions by implementing profit sharing. Which explanation is correct in a particular situation is, of course,
an empirical question. It can only be answered by determining competing implications for each explanation and empirically testing each implication against the necessary data.

Another quite different empirical direction might be to investigate the development of implicit understandings. For this investigation a laboratory approach might be adopted. Subjects could be placed in a lateral relationship where each subject might have control over his own margin and some other control variable. Subjects would be rewarded based on the outcome of each of their decisions. The experiment would then proceed to examine the impact of various circumstances on the outcome of their mutual decisions. For example, the experiment might examine the following effects:

1. the effect of a prolonged relationship rather than a one-time decision,
2. the effect of respondents being able to communicate directly rather than merely knowing the outcomes of the other’s decisions,
3. the effect of knowing the demand function rather than merely having limited knowledge about the product’s demand,
4. the effect of varying production costs on the final equilibrium achieved,
5. the effect of the initial starting point on the final equilibrium achieved,
6. the effect of having a channel consisting of more than two members on the final equilibrium achieved, and
7. the effect of limited communication on the speed at which an equilibrium is achieved.

Conclusion

It is hoped that the next few years will witness marketing researchers’ renewed interest in models of marketing institutions and, in particular, channels of distribution. Many marketing institutional arrangements are observed that rigorous theories need to account for. The result of such inquiries may very well be improved institutional structures and higher productivity of marketing.

References


Editor’s note: The interested reader may find the following additional references useful.

Coordination in Marketing Channels


