Distribution channel choice in a market with complementary goods

Anne T. COUGHLAN

In many market situations - such as in shopping centers, grocery stores, industrial-goods distributors, and 'full-line manufacturers' - we see the marketing and distribution of complementary products. Sometimes the distribution function is handled by the manufacturer himself, and sometimes it is spun off to an independent distributor or middleman. This paper presents an economics-based model which shows incentives for integration or non-integration of the distribution function based on economies of scale and scope in distribution; complementarity in demand across products; and customers' valuation of the benefits of 'one stop shopping'. Such factors explain why manufacturers of narrow product lines may choose to use independent middlemen as a distribution channel, even though that involves a loss of control over retail pricing. They also can explain why the development of a broader product line over time can be accompanied by a switch from a distributor channel to an integrated channel. The model thus extends our understanding of the forces determining distribution channel choice beyond that achieved by other models based on substitutable (rather than complementary) products.

1. Introduction

Distribution outlets handling multiple products which are complementary to each other - a product line - are everywhere around us. Grocery stores handle peanut butter and jam, meat and potatoes, and vegetables and fruits. Industrial product distributors offer full product lines, so that their customers can buy all their needs at one outlet. Stereo stores offer components made by different manufacturers, as well as the expertise of putting the sound system together for the buyer. There are even agents in the semiconductor industry who offer 'turnkey plants' to semiconductor firms, which come completely assembled and ready to produce final output. We also see some manufacturers using independent distributors to sell their products when the firm's product line is narrow, but switching to a wholly-owned distribution channel when the product line grows more broad over time.

This paper deals with the question of why these different distribution channel arrangements might be efficient. We model pricing and distribution channel choices by considering a set of complementary products, made by different manufacturers. The distribution cost function reflects economies of scale and scope; that is, selling higher volumes implies lower unit costs of distribution. Further, using an independent distributor may imply access to a lower distribution cost function than if a manufacturer distributed his product himself. We also consider the demand benefits offered through 'one-stop shopping', where customers value having a full assortment of products available at one distribution site.

In this market framework, we consider several different channel possibilities. Products can be distributed individually through wholly-owned channels, with no cooperation in either pricing or distribution. They can be distributed through independent exclusive distributors who do not cooperate with each other. Both price and distribution decisions can be made cooperatively, through a joint

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integrated channel. Finally, a single independent distributor can perform the pricing and distribution functions for the complementary products in a coordinated channel. In this case, questions of bargaining and the split of total channel profits among the manufacturers and the distributor are of interest.

The paper has several goals. First, it extends the current modeling literature on distribution channel choice to consider several real-world marketing phenomena which strongly affect both optimal pricing and optimal channel choice. Second, the model is designed to reveal how coordination at different levels can increase the profitability of selling complementary products. Third, the model can explain the persistence of successful distributors over time, as well as the development of own distribution outlets by manufacturers of ever-broadening product lines. Finally, we offer some insight into the problem of bargaining with an independent distributor, and the nature of a channel-profit-maximizing contract with such a distributor.

Below, we first review the relevant literature on channel choice, product-line pricing, and economies of scale and scope. Next is a description of the structure of the model and the channel configurations considered in the analysis. Following this, the results from the model are discussed, including the nature of profit-maximizing prices in different channel structures and comparative-static effects of various demand and cost parameters on optimal pricing.

2. Literature review

Since this paper concerns the issue of choosing a marketing channel to maximize profits in the presence of complementary goods, 'one-stop shopping' effects, and economies of scale and scope in the distribution function, there are several relevant literatures to cite. Here, we discuss three: the literature on pricing in distribution channels, the literature on product line pricing, and the literature on economies of scale and scope.

Two recent review papers on pricing (Nagle (1984) and Rao (1984)) discuss pricing in a distribution channel. Both state that the marketing literature has not treated this issue in detail, although Nagle cites some economic theorists who have done work in the area. Of the marketers working on the topic, Jeuland and Shugan (1983) abstract from inter-brand competition and concern themselves mainly with the problem of coordination among members of a single marketing channel. McGuire and Staelin (1983) and Coughlan (1985b) model the distribution channel choice in a duopoly market, where each manufacturer produces just one (substitutable) product and considers whether to integrate or to use an independent and exclusive middleman. None of the three papers permits economies of scope or scale in distribution, nor do middlemen have any cost advantage over manufacturers. Coughlan and Wernerfelt (1987) generalize the channel problem further, arguing that the use of middlemen is an equilibrium channel strategy under very general conditions, but relies on the observability of contracts.

A comparatively wide selection of books and articles deals with product-line or multi-product pricing. Palda (1971) states the key distinction between single-product and product-line pricing; the single-product theory is sufficient to deal with multi-product pricing problems only if both the products' costs of production/marketing and their demands are unrelated. Monroe and Della Bitta (1978) also outline these factors intuitively in their review of pricing models. Two other general approaches to multi-product pricing are in Bailey (1954), who takes a graphical approach, and Oxenfeldt (1966), whose arguments are qualitative. Analytical models of multi-product pricing of substitutable goods include...
Oren, Smith and Wilson (1984), Katz (1984), and Moorthy (1984a, 1984b). Monroe and Zoltners (1979) focus on the product-line pricing problem when there is scarcity of some common input to all the products in the line (e.g., oil in the petrochemicals industry). Urban (1969) places the pricing problem in the wider context of the entire marketing mix problem for a product line, and provides an empirical example to support his analytical model. Finally, Telser (1979) shows that bundling different sets of complementary products is a means of segmenting a market. The wider areas of pricing with bundling, tie-in sales, and resale price maintenance are too extensive to survey here; Nagle (1984) reviews this literature. In sum, while there is a wide set of papers and books on the pricing of multiple products, it is not primarily concerned with the pricing of these products in a distribution channel.

On the cost side, non-constant marginal costs cause the pricing problem for multiple-product firms to be complicated, since the price chosen for (and hence the quantity sold of) one product has an impact on the marginal cost of selling and/or producing other products in the line. A review article by Bailey and Friedlaender (1982) summarizes the economies literature dealing with this problem. An important work in the area is a book by Baumol, Panzar and Willig (1982), which summarizes in detail much of the earlier work dealing with economies of scope and scale, as well as developing new theory in the area. Obviously, the concepts of economies of scale and scope can just as well pertain to distribution costs as to production costs; hence they are relevant for the marketing problem of distributing a set of complementary products.

The fact that three separate literatures are discussed here is an indication that these three topics have not yet been combined in a model to explain distribution channel choice. The inclusion of these factors helps explain channel choice because the resulting model structure is richer and because the richness captures real elements in distribution channels. Below, we discuss the model and its solution.

3. Structure of the model

This section describes the elements of a general model of marketing channel choice in the presence of complementary goods. Throughout, we examine an industry with two manufacturers, each of whom makes one product.¹

3.1. Demand and cost concepts

One important demand-side factor when selling a complementary product line is the benefit of ‘one-stop shopping’.² For instance, a buyer of a production line to assemble semiconductor chips finds it valuable to purchase a ‘turnkey’ plant, with all the parts supplied and assembled by one manufacturer or middleman, because he thereby avoids the problems of ‘tweaking knobs’ until the system works. We incorporate complementarity and one-stop shopping in the demand function as follows:

\[ q_i = a - bP_i - cP_j \quad i = 1, 2, \quad j = 3 - i, \quad (1) \]

\[ a > 0, \quad b > 0, \quad c > 0, \quad b > c. \]

¹ However, the results hold true for a market with \( n \) manufacturers of complementary goods. In addition, the model has insights for a set of manufacturers, each of whom may make more than one complementary product. See Coughlan (1985a) for details.

² Oxenfeldt (1966) uses this term as just one source of demand complementarity. He lists seven other sources. We use the term ‘one-stop shopping’ to represent a somewhat more general effect on demand. It could act by increasing overall demand at any price, without affecting own- or cross-price demand derivatives; or it could change own-or cross-price demand sensitivity. Manufacturers and distributors could purposefully influence the extent of the ‘one-stop shopping’ effect through marketing mix expenditures. Such possibilities are discussed further in later sections.
The complementarity of the products is indicated by the negative cross-price derivative \( \frac{\partial q_i}{\partial p_j} = -c \). The one-stop shopping effect operates when the two products are sold through the same distribution channel by discretely increasing the value of \( a \) (making the quantity demanded higher at every price), or decreasing the value of \( b \) or \( c \) (decreasing own- or cross-price sensitivity). In addition, we consider the possibility that demand for a given product may be stronger (represented by an increased value for the parameter \( a \)) when sold through an independent channel than through an integrated one – for instance, because of superior knowledge of market demand by the independent distributor.

On the cost side, an independent distributor is often used because he can sell at a lower unit cost than can a manufacturer of a single product alone. 3 There are two possible sources for the lower unit cost: economies of scale and economies of scope. 4 We represent these phenomena with the following cost function associated with selling a total of \( Q \) units of \( q_1 \) and/or \( q_2 \) through a given channel:

\[
C = f + (m + g)Q - hQ^2, \tag{2}
\]

\[g - 2hQ > 0, \quad -2h < 0 \quad (i.e., \ h > 0),\]

where \( f \) is the fixed cost of distribution, \( m \) is the constant marginal cost of manufacturing, and \( g \) and \( h \) are parameters of the distribution cost function. We assume for simplicity that \( m \) and \( g \) are the same for the two products. All the parameters are assumed to be positive.

These elements of the model are sufficient to allow us to examine different channel arrangements to distribute complementary products. In the next section, we describe the channel structures considered in the analysis.

### 3.2. Channel structures with complementary goods

Four different channel arrangements will be examined (see table 1). One is the case where each product is distributed through an independent exclusive distributor. A second situation occurs with each product distributed through an exclusive but integrated channel; this case is shown to be a special example of the first case. A third case involves the establishment of a common and integrated distribution agency for the complementary products. Finally, we consider the case in which the manufacturers use a common, but decentralized, channel (i.e., a single distributor) for both goods.

Our Case 1 corresponds to the delegated (or decentralized) case with complementary products under price competition examined in Coughlan and Wernerfelt (1987). 5 The retail level is competitive. Each manufacturer auctions off the rights for his product to the highest-bidding distributor; competition reduces distribution-level profits to zero. The

### Table 1

<table>
<thead>
<tr>
<th></th>
<th>Sell products separately</th>
<th>Sell products together</th>
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<tbody>
<tr>
<td>Integrate</td>
<td>Case 2</td>
<td>Case 3</td>
</tr>
<tr>
<td>Use distributors</td>
<td>Case 1</td>
<td>Case 4</td>
</tr>
</tbody>
</table>

3 The same efficiencies may be enjoyed by a manufacturer selling a large product line through an integrated channel.

4 Note that these are both static notions, as opposed to yet a third reason for lowered unit costs, dynamic cost economies or learning economies. These are unit cost declines associated with increased cumulative volume. Since we do not model channel choice as a dynamic problem, we do not consider this third type of cost economy. But it may well be present in distribution functions as well as in the more commonly-cited production functions. Further, another source of lower unit costs for the distributor can be simply the distributor's greater efficiency or distinctive competence at performing distribution functions.

5 This is one case examined by Coughlan and Wernerfelt; the results are generalizable to other market and competitive structures as well.
manufacturers are Stackelberg leaders relative to the distributor level. Each distributor thus picks the market price that maximizes his profits:

$$\max_{\Pi_i^D} \left( p_i - g - w_i \right) q_i + h q_i^2 - f_i, \quad (3)$$

$$i = 1, 2,$$

where $w_i$ is a fixed fee charged for the right to resell the product. Knowing the distributor-level reaction functions, each manufacturer then picks his wholesale price to maximize channel profit, letting $t_i$ perform the function of re-allocating distributor-level profit to him:

$$\max_{\Pi_i^M} \left( p_i^* - g - m \right) q_i^* + h (q_i^*)^2 - f,$$

$$i = 1, 2,$$

where asterisks denote the incorporation of reaction functions into the maximization. Note that in this case, neither one-stop shopping effects nor economies of scope exist, since the products are distributed separately.

In Case 2, as in Case 1, these two effects are absent, but the manufacturers perform the distribution function themselves. Each product's price is set to maximize the profit function for that product alone:

$$\max_{\Pi_i} \left( p_i - g - m \right) q_i + h q_i^2 - f,$$

$$i = 1, 2.$$

It is clear by comparing eqs. (3) and (5) that the market price decision rule in Case 2 differs from that in Case 1 only to the extent that $w_i$ differs from $m$. In this sense, the solution for Case 2 is a subset of that for Case 1.

In Case 3, we assume that a joint integrated channel distributes and prices the complementary products. Joint distribution enhances the benefits from economies of scale and scope. Further, the benefits of 'one-stop shopping' can affect demand positively, since customers can come to just one distribution outlet for all their complementary product demands. There is only one maximization problem to be solved in this Case: the choice of a set of prices to maximize the joint profit function of all the products:

$$\max_{\Pi_i^D} \left\{ \sum_{i=1}^{2} \left( p_i - m - g \right) q_i^* - f + h (q_i^* + q_{i'}^*)^2 \right\}, \quad j = 3 - i, \quad (6)$$

where $q_i^*$ indicates a demand function modified to reflect one-stop shopping. We could represent this by any one of the three effects: an increased value of $a$, a decreased value of $b$, or a decreased value of $c$ as compared to Cases 1 or 2.

Finally, Case 4 assumes that the complementary goods are sold through one independent distributor. This distributor may have superior experience or knowledge of the market that gives him a cost advantage over the manufacturers (whether they distribute alone as in Case 1, or together as in Case 3). The benefits of using an independent distributor also depend on the bargaining power of each party. If a manufacturer is small relative to others using a distributor, the distributor will have the power to dictate the terms of the distribution agreement. On the other hand, if several small manufacturers band together to hire an independent distributor (or if one disproportionately large manufacturer seeks a distributor), those manufacturers are likely to appropriate a greater proportion of the gains from the agreement. 7 We cannot predict what

6 Such was the case in the 'early days' - the 1960s - of overseas selling of semiconductor components and equipment by US manufacturers. Independent distributors in Western Europe and Japan knew who the relevant customers were in those markets (a demand advantage) and were also more efficient in dealing in the foreign markets with their foreign customs (a cost advantage). These factors are reflected in empirical work described in Coughlan (1985b) and Anderson and Coughlan (1987).

7 This could be seen in Sanyo's conduct with its distributors; one recent article (Schlesinger (1984)) mentions that 'Many longtime Sanyo distributors have been cut off this year, the victims of the company's recent campaign to bolster its already strong position in the audio and visual equipment business'. Part of the new agreement involves higher quotas for each remaining distributor.
this balance of power will be, but we can characterize the optimizing problem and outcome.

Consistent with Case 1, we assume that the distributor contracts to pay each manufacturer two different fees for the privilege of selling each of his products and the ability to set the final price for the product: a fixed fee, $t_i$, and a constant per-unit fee, $w_i$, for product $i$. We also assume that the total payments to manufacturer $i$ must at least cover his total manufacturing costs (i.e., the manufacturer’s net profit must be non-negative). The problem is then for the distributor to set the final product prices to maximize his profits:

$$\max_{p_1, p_2} \prod^D = \sum_{i=1}^2 (p_i - w_i - g)q''_i - f + h(q''_i)^2 - \sum_{i=1}^2 t_i,$$

(7)

where $q''_i$ indicates the demand function facing the distributor. It may have a higher value of $a$ or a lower value of $b$ or $c$ than in Cases 1 through 3, although the basic functional form is still as in (1).

4. Results from the model

In this section, we first compare pricing policies, profitability, and customer welfare in Cases 1, 2, and 3. The equilibrium values of prices, quantities sold, and profits in each case are presented in table 2. We then examine the option of using a single independent distributor – Case 4 – and define an optimal contract with the distributor which maximizes channel profits.

4.1. Pricing and the advantages of cooperation

Of the first three cases, Case 3, involving cooperation in both price-setting and distribution, is the most profitable. On the cost side, the cooperative distribution in Case 3 lowers unit costs relative to those in Cases 1 and 2 (both of which involve separate distribution) because of the economies-of-scale phenomenon. Economies of scale exist in both Cases 1 and 2, but to the extent that economies of scope cause larger volumes of each good to be produced, economies of scale are also greater in Case 3 than in Case 1 or Case 2.

In addition, on the demand side, joint distribution in Case 3 generates a ‘one-stop shopping’ effect, which also increases profitability. If one-stop shopping effects operate by increasing the demand function intercept or by lowering own- or cross-price elasticities at every price, then an increase in one-stop shopping effects implies a rightward shift or rotation of the entire demand function – that is, an increased willingness to pay for any given quantity. Logically, such a change can only increase profits, since either shifting pattern of the demand function generates an increase in quantity sold, and hence in revenues (since these price-setting manufacturers operate in the price-elastic portion of the demand curve), and since unit costs fall with volume. Thus, both cost-side and demand-side effects imply greater profitability in Case 3 than in Cases 1 or 2.

We can also compare price levels in the three cases; this permits us to evaluate when customers are better off, in the sense of facing lower prices for the complementary products they buy. The following proposition makes this comparison:

8 To see that quantity sold in Case 3 is an increasing function of the strength of the one-stop shopping effect, note first that an increase in the demand function intercept means a parallel rightward shift of the demand function, and hence both higher equilibrium prices and higher equilibrium quantities. Decreasing own- or cross-price demand elasticities (in absolute value) at every price is equivalent to decreasing the sensitivity of demand with respect to the parameters $b$ or $c$. An application of the chain rule, along with the fact that equilibrium prices fall as own- or cross-price demand sensitivity rises (in absolute value), yields the conclusion that equilibrium quantities are higher, the stronger one-stop shopping effects are.

9 The proof of this proposition is available from the author.
### Table 2
Equilibrium values of price, quantity and profits in Cases 1–3. *a*

<table>
<thead>
<tr>
<th></th>
<th>Price</th>
<th>Quantity</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>(a(1-2bh) + b(m+g)) / (2b(1-bh) + c(1-2bh))</td>
<td>(b[a-(b+c)(m+g)] / (2b(1-bh) + c(1-2bh)))</td>
<td>((p^* - m - g)q^* - f + hq^*^2)</td>
</tr>
<tr>
<td>Case 2</td>
<td>(a(1-2bh) + b(w^* + g)) / (2b(1-bh) + c(1-2bh))</td>
<td>(a - (b+c)p^*) / (2b(1-bh) + c(1-2bh))</td>
<td>((p^* - m - g)q^* - f + hq^*^2)</td>
</tr>
<tr>
<td>Case 3</td>
<td>(a + (b+c)(m + g - 4ah)) / ((b + c)[1-2h(b + c)])</td>
<td>(a - (b+c)(m + g)) / (2[1-2h(b + c)])</td>
<td>((p^* - m - g)q^* - 0.5f + 0.5h(2q^*^2))</td>
</tr>
</tbody>
</table>

*a By the symmetry of the problem, equilibrium prices for the two products are equal, as are equilibrium quantities and equilibrium profits.

Where \(w^*_1\) is the equilibrium wholesale price:

\[
w^*_1 = \frac{c^2(1-2bh)[a - g(b+c)] + m[2b(1-bh) + c(1-2bh)][2b^2(1-bh) - c^2(1-2bh)]}{b \left(4b^2(1-bh)^2 + c(1-2bh)(2b - h(b-c)^2)\right)}.
\]

**Proposition 1.** In the absence of one-stop shopping effects, equilibrium prices in Case 2 are always lower than those in Case 1, and equilibrium prices in Case 3 are always lower than those in Case 2.

This proposition implies that, barring any one-stop shopping demand effects, Case 3 provides the highest customer welfare. Case 2 implies higher prices than Case 3 and thus lower customer welfare. Case 1 generates the highest prices and the lowest customer welfare. In the presence of one-stop shopping effects in Case 3, even though equilibrium prices may be higher than in their absence, we cannot conclude that customer welfare is thereby harmed. The very presence of these effects implies that customers value the collection of goods in one location, and hence, are willing to pay more for such an arrangement.

It is interesting to contrast these results with those in similar problems, but in which the products concerned are substitutes in demand rather than complements (see, e.g., Coughlan (1985b), Coughlan and Wernerfelt (1987), or McGuire and Staelin (1983)). Cooperative pricing of substitutes produces higher prices than do separate integrated channels, and hence lower customer welfare. Further, in our model with complementary goods, using exclusive and independent distributors (as in our Case 1) is never more profitable than integration without joint distribution, in contrast to the results with substitutes. These differences are due largely to the difference in assumption about product substitutability versus complementarity, but are strengthened by the inclusion of economies of scale or scope and one-stop shopping effects.

Finally, the comparative-static effects on equilibrium prices of changes in the one-stop shopping effect (whether by changing the demand function intercept \(a\), the own-price derivative of demand \(b\), or the cross-price derivative of demand \(c\)), marginal distribution and manufacturing costs, and economies of scale and scope (represented by the parameter \(h\)) are also of interest. A summary of the effects is in table 3. The following general insights emerge:

- In Case 3, the stronger are one-stop shopping effects which increase the demand intercept, the higher are equilibrium prices.
- Equilibrium prices also are a positive function of the expertise of the independent
Table 3
Comparative-static effects in Cases 1-3.

<table>
<thead>
<tr>
<th>Of an increase in:</th>
<th>Effect on equilibrium price in:</th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>n/a</td>
<td>positive</td>
<td>positive</td>
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<tr>
<td>b</td>
<td>negative</td>
<td>negative</td>
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<td>g</td>
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<tr>
<td>h</td>
<td>negative</td>
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</table>

a Sufficient condition is ∂w/∂b < 0.
b Sufficient condition is ∂w/∂c < 0.

- Prices are higher, the less sensitive demand is to own-price changes.
- Prices are higher, the less sensitive demand is to cross-price changes.
- Prices are higher, the higher are marginal manufacturing and distribution costs.
- Prices are lower, the stronger are economies of scale and scope.

These findings show a positive relationship between the strength of the one-stop shopping effect and equilibrium price levels under a wide variety of conditions, whether the one-stop shopping effect is due to an increase in the demand intercept or a decrease in own- or cross-price demand sensitivity. The manufacturer and/or distributor can actively influence the strength of the one-stop shopping effect through marketing mix expenditures, thus controlling to some extent the optimal price level rather than taking it as given.

On the cost side, increased marginal costs are passed through to the retail price level. Equilibrium prices are also influenced by the extent of economies of scale and scope. The stronger are these economies, the more profitable are high volumes sold, since higher volumes are associated with lower unit costs. To gain these higher volumes, prices are decreased.

4.2. Using an independent distributor to sell complementary products

Case 4, in which manufacturers of complementary goods use a common independent agent as a distribution channel, bears many similarities to Case 3, in which the manufacturers band together to form their own cooperative distribution channel. Here, we discuss those similarities as well as the important differences between these two cases. To establish the analytical similarities between Cases 3 and 4, one needs only to compare eqs. (6) and (7). There are two differences between the problems. First, the manufacturers in Case 3 bear a marginal manufacturing cost of $m_i$, while the distributor in Case 4 bears a marginal per-unit cost of $w_i$ (the per-unit payment to the manufacturer for his product). Second, the distributor in Case 4 also bears a fixed cost of $t_1 + t_2$, the sum of the fixed payments to the two manufacturers, while the manufacturers themselves, of course, do not bear that cost in Case 3.

However, the values of the fixed payments $t_i$ do not change the distributor’s choice of prices to charge, since they do not enter into any marginal decisions he makes. Hence, the two problems are exactly analogous, except for any difference between $w_i$ and $m_i$, and except for any difference in cost or demand advantages between the manufacturer and the distributor. If $w_i$ equals $m_i$, and the distributor has no cost or demand advantage over the manufacturer, then equilibrium prices are the same in Cases 3 and 4, as are total channel

10 Note that a manufacturer could take advantage of these one-stop shopping effects not only by distributing cooperatively with other manufacturers, as in our Case 3, but also by jointly distributing with other manufacturers using an independent distributor, or by individually broadening his product line while still distributing only his own products.

11 Urban (1969; 41) suggests, for instance, that an increase in advertising expenditures could well act to decrease both own- and cross-price demand elasticities: other actions, like increasing salesforce effort, could have the same impact.
profits. Manufacturers would not use an independent distributor in this situation, since they would be splitting total channel profits of a given size over a larger group of agents (the distributor in addition to the manufacturers themselves).

This does not mean that using a distributor is unlikely to be more profitable than the available alternatives, however. It may well be that the distributor has some cost or demand advantage over the manufacturers that makes total channel profits higher when he is the distributor than when the manufacturers form their own cooperative distribution arm. Anderson (1985) indicates that electronic components manufacturers believe distributors to be superior salespeople to their own salesforces, and believe them to have superior access to preferred customers and stronger long-run business relationships with their customers. In addition, Coughlan (1985b) and Anderson and Coughlan (1987) give indirect evidence that semiconductor distributors in overseas markets, particularly Western Europe and Japan, had clear cost and demand advantages over US manufacturers seeking to break into those foreign markets in the 1960s and 1970s. This evidence indicates that in fact, an independent distributor can make the ‘profit pie’ larger than manufacturers on their own can do.

Further, a cooperative agreement among many manufacturers as described in Case 3 may not be a stable channel alternative, since each manufacturer has an incentive to shirk and gain from short-run increases in profits by raising his price (to the detriment of his partner’s profits). The shirking problem arises because the negative externalities of one manufacturer’s price increases are borne entirely by another manufacturer. In this case, an independent distributor can internalize the negative externalities which could decrease the profitability of Case 3 from its idealized (i.e., entirely cooperative) level.

If using an independent distributor can in fact be more profitable than any of the three possibilities discussed in the above section, how can the distributor’s compensation contract be stated to insure the best outcome for the manufacturers? This issue really comprises two smaller questions: first, the question of the general nature of the distributor’s compensation contract and the incentives created by it; and second, the relative power of the distributor and the manufacturers in the agreement, and therefore, the actual split of the total channel profits. We discuss each of these issues in turn.

For any given agreement about the split of total channel profits, the manufacturers will be best off if the distributor has the same incentives as they themselves do, since then the distributor will want to set prices in the same manner as the manufacturers themselves would want, were they to cooperate in the Case 3 style and face the costs and demand conditions that the distributor in Case 4 faces. The problem is then one of constructing an ‘incentive-compatible’ contract. 13

We have argued above that the distributor’s profit-maximization problem in Case 4 produces the same decision rules concerning optimal pricing as in the cooperative Case 3 if the distributor pays each manufacturer a per-unit fee equal to the marginal manufacturing cost. Then no matter what are the fixed fees, paid to each manufacturer, the distributor will make the same pricing deci-

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12 In addition, if many manufacturers, rather than just two, were all involved in a cooperative distribution agreement, shirking would be difficult to monitor.

13 Jensen and Meckling (1976) and Harris and Raviv (1978) describe the problem of divergent incentives between a principal and his agent as the ‘agency problem’, and discuss methods of creating incentive-compatible contracts in these situations. In the marketing literature, Basu et al. (1985) discuss the problem of increasing the compatibility of incentives between a firm and its salesforce via compensation contracts in the presence of uncertainty in the sales response function.
sions as would the manufacturers in Case 3 if
they faced the same cost and demand condi-
tions. Hence, an incentive-compatible con-
tract between the manufacturers and the dis-
tributor involves the distributor paying each
manufacturer a fixed fee, \( t_i \), and a per-unit
fee of \( m_i \), the marginal cost of manufactur-
ing. This is a type of two-part tariff (see Oi
(1971)), paid by the distributor to the manu-
facturers for the privilege of distributing their
products. It is an incentive-compatible con-
tract because it provides the distributor with
the same incentives as the manufacturers. The
manufacturers do not need to monitor the
distributor to see if he is setting prices which
they desire – the distributor wishes to set the
‘right’ prices, since they also maximize his
own profits.

This type of contract is very closely ap-
proximated in many distributor agreements
(see Anderson (1985) for evidence of this). A
common agreement involves the distributor
bearing all his distribution costs, and receiv-
ing a per-unit commission on sales. The only
difference between this agreement and the
‘incentive-compatible’ one described above is
the presence of the fixed fee, \( t_i \). However, it is
quite possible that these distributor agree-
ments would also entail an up-front payment
from the manufacturer to the distributor,
which would correspond to the fixed pay-
ment, \( t_i \), in this model. This contract form is
also commonly used in franchising: the
franchisor (McDonald’s, for instance) is paid
a lump sum by the franchisee in return for
the right to operate at a particular location, as
well as a royalty based on monthly sales
(Agins (1984)). The lump sum corresponds
directly to the fixed fee, \( t_i \), and the royalty
corresponds to the per-unit commission.

The size of the fixed payments, \( t_i \), depends
on the relative bargaining strength of the
parties at the time the contract is signed –
that is, on the ‘power’ of the distributor vis-à-
vis the manufacturers. In an incentive-com-
patible contract, we expect the power of the
distributor to be greater, and hence the \( t_i \) to
be smaller:

- the greater is the cost advantage of the
  independent distributor over the coopera-
tive distribution arm organized by the
  manufacturers in Case 3;
- the greater is the overall demand ad-
vantage enjoyed by the distributor;
- the fewer alternative distributors there are
  for the manufacturers to choose from; and
- the greater is the likelihood of successful
  shirking or cheating on a cooperative
  agreement among the manufacturers in
  Case 3.

There are upper and lower limits to the
share of total channel profits which the dis-
tributor can appropriate in such an agree-
ment, based on the parties’ opportunity costs
of entering this channel arrangement (i.e., the
value of their next-best alternative). The up-
per limit to the distributor’s profit share is the
manufacturers’ opportunity cost of using the
distributor; the lower limit is the distributor’s
own opportunity cost of selling these manu-
facturers’ products. Hence, if there are very
few distributors able to handle the manufac-
turers’ products, the distributor’s profit share
is likely to be high. If, on the other hand, the
distributor is desperate for business, his profit
share is likely to be lower.

For example, consider a set of reasonable
parameter values: \( a = 1, \ b = 0.5, \ c = 0.4, \ m
= 0.25, \ g = 0.3, \ h = 0.2 \). Case 3 is more prof-
itable than Cases 1 or 2, generating profits of
0.11 for each manufacturer (with profits of
less than 0.10 in both of the other cases).
However, suppose using a joint distributor
permits the channel to take advantage of a
strong one-stop shopping effect, represented
by an increased value for \( a \) of 1.3. Then using
a distributor increases the profit per product
from 0.11 in Case 3 to 0.28 in Case 4. A very
powerful distributor who knew that the two
manufacturers had no other channel alterna-
tives (no other distributors to approach, for
instance) would be able to extract all the extra profits, except for a very small bit to be given to each manufacturer to make them willing to sell through this distributor. Hence the distributor would make a profit of slightly less than 0.17 on each product. The relatively powerless manufacturers would be able to get only marginally more than their alternative profit level of 0.11 per product, making them marginally willing to undertake the deal with the distributor.

If the manufacturers are the powerful partners in the deal, however (e.g., because they know that the distributor has no other manufacturers to turn to to acquire such a product line to sell), their gains are limited only by the reservation price of the distributor. Suppose he faces a next-best alternative which would generate a profit of 0.10 per product for him. Then the powerful manufacturers would be able to induce him to take just more than 0.10 in profits per product in return for handling their two products, and the manufacturers would walk away from the deal with profits of slightly less than 0.18 each (the difference between 0.28 and 0.10). This would clearly be more beneficial to the manufacturers than the Case 3 option with profits of 0.11 apiece.

The incremental benefit from using a joint independent distributor is even greater if, for some reason, a joint integrated channel (as in Case 3) is impossible to maintain. Thus, if shirking problems confine the manufacturers' channel choices to Cases 1, 2, or 4, separate integration (Case 2) is preferred to using independent exclusive distributors (Case 1), but using a joint independent distributor (Case 4) would be relatively much more profitable.

Note that the systematic conditions which favor the use of an independent distributor – strong economies of scale and scope, one-stop shopping effects on demand, and differential comparative advantages of distributors versus manufacturers in carrying out the distribution function – can also explain why some distributors continue to operate profitably over time (they have persisting advantages in costs or demand), and why a manufacturer might want to move from a distributor channel to a wholly-owned channel as his product line widens over time (he can take advantage of economies of scale and scope himself, without having to split the profits with an independent distributor).

5. Conclusion

This paper presents a model of pricing and distribution channel choice based on a market of complementary goods, where distribution costs exhibit economies of scale and scope, and customers value one-stop shopping. Under these conditions, using independent exclusive distributors is always less profitable than using separate integrated channels. In addition, increased levels of coordination – through cooperative pricing and distribution and through any associated enhanced one-stop shopping effects – are profitable. Pricing practices also vary across different channel structures. Prices are in general higher the less coordination there is in pricing and distribution, abstracting from the one-stop shopping effect. This implies that customers, as well as manufacturers, benefit from increases in channel coordination. Comparative static analysis shows that prices are generally higher (a) the stronger are one-stop shopping effects, (b) the higher are marginal manufacturing costs exhibit economies of scale and scope, and customers value one-stop shopping. Under these conditions, using independent exclusive distributors is always less profitable than using separate integrated channels. In addition, increased levels of coordination – through cooperative pricing and distribution and through any associated enhanced one-stop shopping effects – are profitable. Pricing practices also vary across different channel structures. Prices are in general higher the less coordination there is in pricing and distribution, abstracting from the one-stop shopping effect. This implies that customers, as well as manufacturers, benefit from increases in channel coordination. 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Comparative static analysis shows that prices are generally higher (a) the stronger are one-stop shopping effects, (b) the higher are marginal manufacturing
and distribution costs, and (c) the weaker are economies of scale and scope.

When dealing with an independent distributor, an optimal contract for sharing profits (i.e., an incentive-compatible contract) involves a lump-sum payment plus a commission payment based on sales volume (and equal to marginal manufacturing costs) by the distributor to the manufacturer. However, the model yields no firm predictions about the exact split of these profits, since that split depends on such factors as the relative bargaining strengths of the two parties. More fundamentally, the split is a function of the alternatives open to either party, since the values of these next-best alternatives place limits on the shares going to either bargainer.

The model’s results provide institutional insights into the reasons for the existence of some channel structures today. It indicates that many franchise and distributor contracts, which involve lump sums and per-unit payments from the intermediary to the manufacturer, may well be close to the optimal form. Further, the model implies that a distributor may persist successfully through time when he maintains a persistent cost or demand advantage over the alternatives available to his manufacturer clients. Some of the most persistent advantages may be connected with superior knowledge of a foreign market or with ownership of a superior location. Finally, the model’s findings suggest that a manufacturer with a narrow product line, e.g., a new firm, is likely to benefit from using an independent distributor, but is also likely to switch to a wholly-owned channel as the product line broadens over time.

References


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