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Exclusive Dealing and Price Promotions*

We study retail price promotions and manufacturer trade deals in markets with exclusive dealing. We find that models that do not account for the existence of retailers overestimate the depth of promotions. We then compare the price promotions outcomes of markets with and without exclusive dealing. We also evaluate whether exclusive dealing can be an equilibrium outcome and find that, under certain conditions of the model, the equilibrium is for manufacturers to distribute through several retailers, even though their profits might end up lower than if each retailer carried only one product.

I. Introduction

Price promotions are short-term price discounts offered by retailers. These price cuts are often supported by manufacturers in the form of trade deals. Most of the existing literature on price promotions (Varian 1980; Narasimhan 1988; Raju, Srinivasan, and Lal 1990; Rao 1991; and Agrawal, in press)[1] interprets a mixed strategy to offer an explanation for price promotions. These analyses are typically conducted in the context of competing firms selling one product to satisfy the demand of a heterogeneous consumer base. Since there is no equilibrium in pure strategies, these authors employ a mixed strategies equilibrium framework. The characterization of the equilibrium probability distribution over a range of prices is viewed as promotions and is assumed to be implemented over a large number of periods where the demands over subsequent pe-

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1. See also Conlisk, Gerstner, and Sobel (1984); Green and Porter (1984); Sobel (1984); Rotemberg and Saloner (1986); and Srinivasan (1991), for other perspectives on price promotions.

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riods are independent of each other. Agrawal (in press) extends these analyses to include a retailer which carries both brands but does not incorporate retail competition.

In this article we build on this literature by extending the model to include multiple retailers and evaluating the possibility of exclusive dealing. Exclusive dealing may be important in several markets where there are price promotions, and even though exclusive dealing has been justified on the grounds of existing service externalities among retailers (e.g., Telser 1960), it is important to evaluate its impact on the price promotion intensity. The introduction of intermediaries, that is, retailers, between the manufacturers and the consumers also has important implications for price promotion strategies, as can be seen below.

We start in Section II by obtaining the equilibrium in a market with exclusive dealing. Section III then presents the results without exclusive dealing, and Section IV evaluates the impact of exclusive dealing on the price promotion intensity and on the equilibrium payoffs of retailers and manufacturers. Section V studies whether exclusive dealing can be a distribution outcome, and finally Section VI discusses several testable empirical implications and presents some concluding remarks.

II. Exclusive Dealing

In this section we restrict our attention to the case in which retailers sell only one product. We model the competition at the wholesale and retail levels as follows: there are two manufacturers, A and B, which sell their products, respectively, through retailers A and B. Without loss of generality let us assume that the manufacturers have zero marginal costs of production and that the retailers have zero marginal costs of selling the products. The manufacturers set the prices of sale to the retailers, w_A and w_B, and the retailers set the prices of sale to the consumers, P_A and P_B. Following Varian (1980) and Narasimhan (1988), there are three segments of consumers: one, of size S, buys at the lowest retail price; the other two, of size $\tilde{R}$, are retailer-loyal segments and buy respectively from retailers A and B.[2]

Each consumer has a reservation price r. We compute the subgame perfect equilibrium in retail and wholesale prices in the case in which manufacturers set the wholesale prices simultaneously, and retailers set the retail prices simultaneously after the manufacturers have set the wholesale prices. That is, the sellers (and not the buyers) are al-

2. As it is made clear below, $\tilde{R}$ represents the consumers loyal to that retailer, or to that retailer-manufacturer combination. The results presented here generalize to any other form of demand structure where there is a positive mass of S consumers.

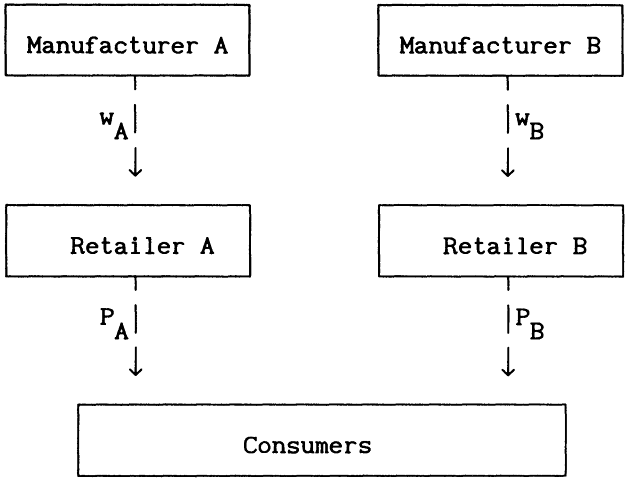

FIG. 1.—Exclusive dealing

ways the ones setting prices (before they know their demand). In the same way as retailers cannot change their prices after the realized demand by consumers, manufacturers cannot change their prices after the realized demand by the retailers. This approach is typical in the analysis of manufacturer-retailer relationships (since Spengler 1950).[3] Finally, each retailer only knows about the wholesale price of the manufacturer from which it buys. Figure 1 presents a diagram of the market relations.

We look for a symmetric equilibrium where the manufacturers use a mixed strategy with cumulative distribution $H(w)$, and the retailers use a retail price which is a strictly increasing function of the wholesale price they pay, $g(w)$. Then the expected profit of a retailer setting a price P and being charged a price w by its manufacturer is

$$(S + \tilde{R})(P - w)\{1 - H[g^{-1}(P)]\} + \tilde{R}(P - w)H[g^{-1}(P)].$$

The retailer sets the price P that maximizes its expected profit given w. Differentiating, equalizing to zero, and using the restriction for symmetric strategies yields the differential equation

$$\left[\frac{\tilde{R}}{S} + 1 - H(w)\right] g'(w) - (P - w)H'(w) = 0. \qquad (1)$$

Now, using the fact that the $g(w)$ is assumed to be strictly increasing,

3. See also Tirole (1988), p. 174. An alternative would be for the wholesale prices to be contingent on demand or negotiated between the manufacturer and the retailer after demand has been observed. This alternative would, however, be even less appealing if the retailers buy (and get) the products from the manufacturers before selling them to the consumers, a relatively general practice.

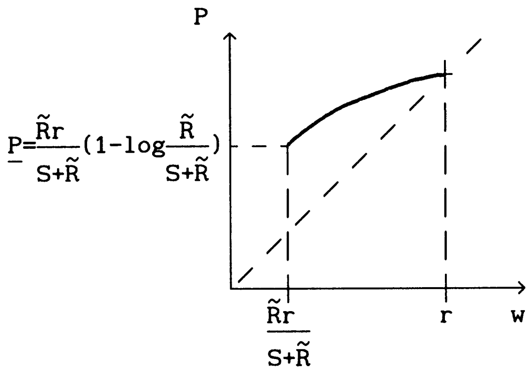

FIG. 2.—Retailer pricing strategy for single-product retailers

we can recall Varian to note that the pricing strategies of the manufacturers are mixed and are as follows:

$$H(w) = \begin{cases} 1 & \text{for } w > r, \\ 1 - \dfrac{\tilde{R}(r - w)}{Sw} & \text{for } \dfrac{\tilde{R}r}{S + \tilde{R}} \leq w \leq r, \\ 0 & \text{for } w < \dfrac{\tilde{R}r}{S + \tilde{R}}. \end{cases} \tag{2}$$

We can then solve (1) (using the restriction that $g(r) = r$) to get the pricing strategy of the retailers:

$$P = w(1 + \log\frac{r}{w}), \tag{3}$$

which is strictly increasing in w (as shown in fig. 2). This yields the first result of the article.

PROPOSITION 1. The subgame perfect equilibrium of the single-product retailers case has the manufacturer following the pricing strategies in (2) and the retailers following the pricing strategies in (3).

Note first that we get the usual result that with middlemen there is less competition, and the profits of the vertical structure are greater (see, e.g., McGuire and Staelin 1983; Moorthy 1988; or Coughlan and Wernerfelt 1989). In this case, retail prices are greater, that is, the depth of promotions is smaller, and demand remains the same. To see this, note that the equilibrium without retailers is exactly equal to the wholesale prices equilibrium and that the retailer always has a positive gross margin.

Second, note that the range of retail prices in equilibrium is smaller than in the case in which no retailers were considered. To see this, note that with no retailers the lowest retail price being charged is equal to the lowest wholesale price being charged in the case with retailers and that the retailers always have a positive gross margin for wholesale prices below r.

Third, there is pass-through of the trade deals offered by the manufacturers, but the percentage markup set by the retailer is increasing in the trade deal being offered, that is, the percentage of retailer's pass-through is less for large trade deals. As the wholesale price decreases, the retailers have a higher incentive to pocket these trade deals and not compete as intensely for the price-sensitive consumers. The percentage markup is log r/w, which is decreasing in w.

Fourth, as in the Varian and Narasimhan models, the depth of promotions is greater the greater the price-sensitive segment and the smaller the retailer-loyal segments (straightforward from the manufacturers' mixed strategies).

Most of the above results are fairly intuitive and not surprising. The next result, which does not fall into this category, is as follows:

COROLLARY 1. Trade deals occur more frequently than price promotions.

This result has face validity in the sense that retailers do not completely pass through all trade deals and buy most of the goods on deal. To see this formally, note that the density function of the wholesale prices is decreasing in the whole domain, that is, deep trade deals occur very frequently (to confirm this, differentiate $H(\cdot)$ twice with respect to w). The density function of retail prices is increasing close to the reservation price (where it tends toward infinity). It is increasing in the domain if and only if the segment of retailer-loyal consumers is small compared with the segment of price-sensitive consumers (the formal condition is $(\tilde{R} + S)/S \leq \exp(\frac{1}{2})$). Otherwise, the density function of retail prices is decreasing for the low values of the retail prices. To see this, just differentiate $H(\cdot)$ twice with respect to P. Given these results, we can say that retail price promotions occur less frequently than trade deals and, when they do occur, they consist of significant price reductions. This result is related to what was stated above: the introduction of intermediaries softens the competition at the retail level. Figure 3 presents density functions for wholesale and retail prices.

Finally, note that the market equilibrium of proposition 1 is unique. To see this, note first that in equilibrium the manufacturers will always play mixed strategies and the retailers will always play pure strategies. The retailer equilibrium would be in mixed strategies if the manufacturers played pure strategies, for example, $w_A \leq w_B$. Then manufacturer B would find it in his best interest to deviate and charge either $w_B - \epsilon$ (with $\epsilon > 0$ and small) or r. This implies that the manufacturer equilibrium is in mixed strategies (and it can be shown that the mixed strategies do not have any mass points and $H_B\{g_B^{-1}[g_A(w)]\} = H_A\{g_A^{-1}[g_A(w)]\}$, for all w).

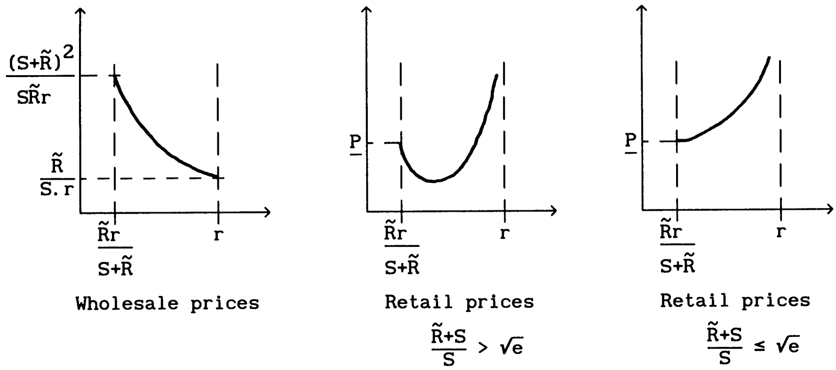

FIG. 3.—Price density functions for single-product retailers

Now, because the manufacturers play mixed strategies (without mass points) in equilibrium, and each retailer only knows about the wholesale price being charged to her, the retailers' strategies have to be in pure strategies (the mixing of the competitor would have to be a function of the wholesale price of the retailer, which the competitor does not know).[4] Finally, the functions $g_A(w)$ and $g_B(w)$ can be shown to be strictly increasing, and because the system of first-order ordinary differential equations resulting from each retailer maximizing its profits is well-behaved, that is, $g'_A(w)$ and $g'_B(w)$ are bounded in the relevant range, it has a unique solution, the symmetric one presented above (see, e.g., Tenebaum and Pollard 1963).

III. No Exclusive Dealing

Let us now consider the case where manufacturers sell their products to both retailers. There are two manufacturers, A and B, and two retailers, 1 and 2. The manufacturers set the prices at which they sell to the retailers, w_A and w_B, and the retailers set the retail prices, P_{A1} and P_{B1} (for retailer 1), and P_{A2} and P_{B2} (for retailer 2). The manufacturers do not price discriminate between retailers. This could be justified by the existing nonprice discrimination antitrust laws. Figure 4 illustrates the market situation.

We need to consider now seven segments of consumers:

One segment, of size S, consists of the price-sensitive consumers. They buy the product that has the lowest retail price (P_{A1}, P_{B1}, P_{A2}, or P_{B2}).

Two segments, each of size R, consist of the retailer-loyal consum-

4. The retail market equilibrium would be in mixed strategies if the retailers knew both wholesale prices in the market.

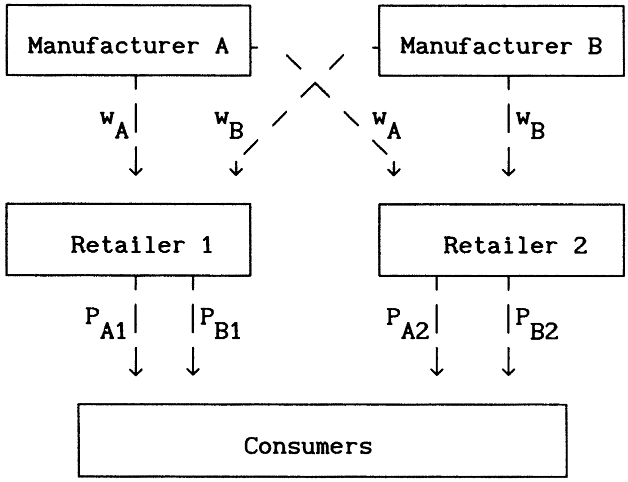

FIG. 4.—No exclusive dealing

ers (one segment per retailer). They always go to the same retailer, and once there, they buy the product at the lowest price.

Four segments, each of size I, consist of price-insensitive consumers, loyal to a certain manufacturer-retailer pair (one segment per manufacturer-retailer pair).

The relation of these market segments to the ones of the previous section is straightforward. The segment of the price-sensitive consumers (segment S) is exactly the same. The segment of the so-called retailer-loyal consumers of the previous section (segment $\tilde{R}$) here has to be segmented further for (i) consumers who are loyal to a retailer but once there buy at the lowest price (segment R), and (ii) consumers who are loyal to a retailer-manufacturer pair (segment I). We then have $R + I = \tilde{R}$.[5] All consumers have reservation price r.

We look for the subgame perfect equilibrium where manufacturers set wholesale prices simultaneously and before the retailers set the retail prices, also simultaneously. We restrict our attention to symmetric equilibria.

The strategy to compute the equilibrium is as follows. First, we

5. Note that the size of the total market increased from $S + 2R + 2I$ to $S + 2R + 4I$. This is because, in the previous section, two types of consumers who were loyal to a retailer-manufacturer pair did not have their product available. These consumers buy only if the product they want at the retailer they want is available at a price below their reservation price. Another type of consumer we could have considered is the manufacturer-loyal consumer, i.e., the consumer who is loyal to a certain manufacturer and shops around among retailers for the best deal. Introducing this type of consumer into the analysis would complicate it substantially in terms of the purpose of this article, without changing the flavor of the results. The analysis of the multiple-product-retailers case with this type of consumer can be seen in Lal and Villas-Boas (1993).

compute the equilibrium in the retail market for all the pairs (w_A, w_B). Second, we find the equilibrium in (w_A, w_B) given the retail market equilibrium that follows.

Consider the retail market equilibrium. Note first that each retailer only wants to cut prices because of the price-sensitive consumers (S). Then, it is only the price of the lowest-priced brand of each retailer that matters in attracting this type of consumer. So, the price of the highest-priced brand is always going to be r, and the highest-priced brand is the one that received the smallest trade deal. For the lowest-priced brand (the brand that received the greatest trade deal), if a retailer offers the smallest price promotion in the market, it gets a demand on that brand of $I + R$; if a retailer offers the greatest price promotion, it gets an additional demand. These are exactly the conditions of the Varian framework, and the equilibrium is of the same type (and is unique; see Baye, Kovenock, and Vries 1992).

Consider now the manufacturer market. Given the equilibrium in the retail market, the manufacturer that offers the smallest trade deal gets a demand of I, and the manufacturer that offers the greatest trade deal gets a demand of $I + R + S$. These are again exactly the conditions of the Varian framework, and the equilibrium is also of the same type (and unique). The following proposition states these results.

PROPOSITION 2. In a market where there is no exclusive dealing the retail market equilibrium has the price of the brand that received the smallest trade deal, B, at r, and the price of the brand that received the greatest trade deal, A, is played as a mixed strategy between $[(I + R)r + Sw_A]/(I + R + S)$ and r, with cumulative probability distribution $F(P_A) = 1 - [S(r - P_A)]/[(I + R)(P_A - w_A)]$. The expected payoff for each retailer is $(I + R)(r - w_A) + I(r - w_B)$. The manufacturer market equilibrium is in mixed strategies with wholesale prices between $2Ir/(2I + 2R + S)$ and r, with cumulative probability distribution $H(w) = 1 - [(2R + S)(r - w)]/2Iw$. The expected payoff for each manufacturer is $2Ir$.

IV. Evaluating Exclusive Dealing

We now compare the equilibria with and without exclusive dealing. Let us consider first the retail market equilibrium. Consider a pair of wholesale prices (w_A, w_B), with $w_A \leq w_B$. For the highest one, brand B, the retail margin in the market with exclusive dealing is, from proposition 1, $w_B \log(r/w_B)$. In the market with no exclusive dealing, the retail margin is, from proposition 2, $r - w_B$. This is greater than $w_B \log(r/w_B)$; therefore, in the market with exclusive dealing there is more pass-through for the brand that received the smallest trade deal.

For the brand that received the greatest trade deal, brand A, in the market with exclusive dealing the retail margin is $w_A \log(r/w_A)$. In the market with no exclusive dealing, the expected retail margin can be computed, from proposition 2, to be $[(I + R)/S]\,(r - w_A)\log\{1 + [S/(I + R)]\}$. Now note that the retail margin of the market with exclusive dealing can be rewritten as $[w_A/(r - w_A)]\,(r - w_A)\log\{1 + [(r - w_A)/w_A]\}$. Furthermore, note that for the smallest w_A in the market with exclusive dealing, $[(I + R)r/(I + R + S)$, the retail margin in such a market can be written as $[(I + R)/S]\,(r - w_A)\log\{1 + [S/(I + R)]\}$, which is the expected retail margin in the market with no exclusive dealing. Now, because the function $x\log(1 + 1/x)$ is increasing in x for x positive, we know that for all w_A greater than the smallest w_A in the market with exclusive dealing, the retail margin on brand A is greater in a market with exclusive dealing than in a market with no exclusive dealing. That is, exclusive dealing hurts the retailer-loyal (R) and the switchers (S) segments.

Consider now the depth of trade deals in the two types of markets. This comparison results, from propositions 1 and 2, in the comparison between $(I + R)/S$ and $2I/(S + 2R)$. This results in looking at the sign of $R(S + 2R) - I(S - 2R)$: if positive, there is a greater depth of trade deals in the market with no exclusive dealing; if negative, there is a greater depth of trade deals in the market with exclusive dealing. Finally, note that $R(S + 2R) - I(S - 2R)$ is positive for a large retailer-loyal (R) segment and for small-switching (S) and price-insensitive (I) segments.

These results are presented in the following proposition.

PROPOSITION 3. Exclusive dealing creates greater pass-through of trade deals for the brand that received the smallest trade deal and creates smaller pass-through of trade deals for the brand that received the greatest trade deal. Exclusive dealing has a greater (smaller) intensity of trade dealing the bigger (smaller) the switching (S) and the price-insensitive (I) segments and the smaller (greater) the retailer-loyal (R) segment.

The first part of the proposition is quite interesting. No exclusive dealing makes the retailers coordinate on their price promotion activity by promoting more (than in exclusive dealing) the brand that was supported with the greatest trade deal and by promoting less (than in exclusive dealing) the brand that was supported by the smallest trade deal.

The second part of the proposition is also interesting in the following way. In a market with no exclusive dealing, the manufacturers lose market power over the retailer-loyal segment (R) but gain market power over the new price-insensitive segment of the new retailer (I), so that the greater R is, the greater the incentive to trade-deal, and the greater I is, the smaller the incentive to trade-deal.

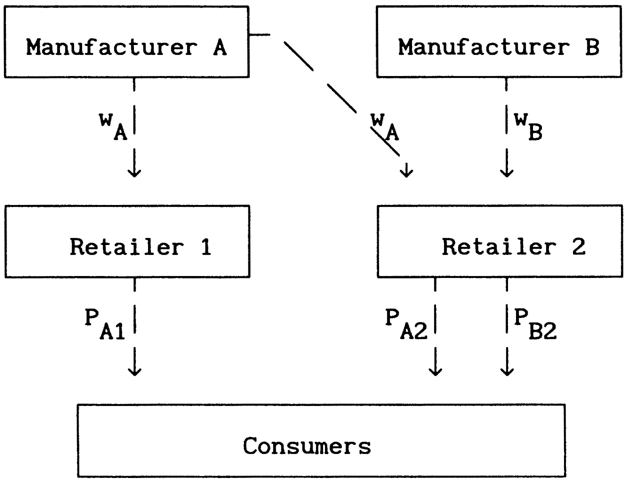

FIG. 5.—The mixed case

V. The Distribution Equilibrium

Let us now try to uncover the distribution equilibrium of the market: what are the market conditions under which we get either exclusive dealing or no exclusive dealing in the market?[6]

In order to answer this question in some form, we consider the following timing of decisions. First, the manufacturers offer to sell their product to just one or both retailers.[7] Second, the retailers decide whether to carry the products that are being offered to them. Third, the manufacturers set the amount of the trade deals. Fourth, the retailers set the level of price promotions.

The third and fourth stages were resolved in Sections II and III for, respectively, the cases of complete exclusive dealing and no exclusive dealing. The mixed case in which one manufacturer, *A*, sells through both retailers and the other manufacturer, *B*, sells through only one retailer, illustrated in figure 5 above, is relatively complicated, and we can only explicitly characterize the manufacturers' equilibrium payoffs.

Note now that in this mixed case, manufacturer *A* is guaranteed of a profit of $(2I + R)r$. The maximum value its demand can have is $2I + 2R + S$. Then, the lowest wholesale price manufacturer *A* is

6. See also Hart and Tirole (1990) for a discussion of this theme in a different setting.

7. Another possibility is to allow the manufacturers to be able to offer contracts to the retailers that require exclusive dealing. If this happens, then if one manufacturer requires exclusive dealing, there will also be exclusive dealing by the other manufacturer. The manufacturers will then require exclusive dealing if and only if their payoff with exclusive dealing, $(I + R)r$ (proposition 1), is greater than their payoff with no exclusive dealing, $2Ir$ (proposition 2), i.e., if $R > I$.

		Manufacturer B: Only one retailer	Manufacturer B: Both retailers
Manufacturer A	Only one retailer	$(I+R)r, (I+R)r$	$\frac{(I+R+S)(2I+R)r}{2I+2R+S}, (2I+R)r$
	Both retailers	$(2I+R)r, \frac{(I+R+S)(2I+R)r}{2I+2R+S}$	$2Ir, 2Ir$

FIG. 6.—Manufacturers' payoffs

willing to charge, $\underline{w}_A$, may have to satisfy $(2I + 2R + S)\underline{w}_A = (2I + R)r$, that is, $\underline{w}_A = [(2I + R)r]/(2I + 2R + S)$. Furthermore, manufacturer B is guaranteed of a profit of Ir. The maximum value its demand can have is $I + R + S$. Then, the lowest wholesale price manufacturer B is willing to charge, $\underline{w}_B$, may have to satisfy $(I + R + S)\underline{w}_B = Ir$, that is, $\underline{w}_B = Ir/(I + R + S)$. Note now that $\underline{w}_B < \underline{w}_A$. But, as in Narasimhan (1988), manufacturer B is not willing to charge any price below $\underline{w}_A$. Then, again as in Narasimhan, manufacturer B's profit has to be $(I + R + S)\underline{w}_A$, that is, $[(I + R + S)(2I + R)r]/(2I + 2R + S)$ (and manufacturer A's profit is $(2I + R)r$).

Assuming now that each retailer, when offered the possibility of carrying both products, accepts it (this assumption is discussed below), the market situation in the first stage for the manufacturers can be shown as presented in figure 6.

Note then that there are only two possible equilibria: no exclusive dealing or the mixed case (in any case, there is never complete exclusive dealing in this type of market). No exclusive dealing is the only equilibrium if and only if $2I > [(I + R + S)(2I + R)]/(2I + 2R + S)$, that is, if and only if $2I^2 + IR - R^2 - RS > 0$. This condition is satisfied if R, the retailer-loyal segment, is not too large (e.g., $I = R = S$ satisfies that condition). More important, note that if $R > I$, this condition can be satisfied, and the manufacturers are worse off in equilibrium than if they were both able to coordinate in exclusive dealing.

If R is too large, then the market will have one retailer distributing only one product and the other retailer distributing both products.

Finally, let us briefly discuss whether retailers are willing to carry all the products that they are being offered. Consider first the change from complete exclusive dealing to the mixed case (consider fig. 5 and the case of retailer 2). On the one hand, when carrying brand A, retailer 2 will now have its demand increased by I, which it enjoys. On the other hand, the trade deals offered to retailer 2 have now changed. Manufacturer B now has greater incentives to offer large trade deals:

when these incentives are defined as the ratio of the additional demand for manufacturer B if it offers a sufficiently large trade deal and the demand already guaranteed (to manufacturer B), the incentives change from $S/(I + R)$ to $(S + R)/I$.

In the same way, manufacturer A's current incentives to offer large trade deals, $(S + R)/(2I + R)$, can be compared to the incentives of the trade deals previously offered to retailer 2, $S/(I + R)$. These current incentives are greater if and only if $R^2 + RI - IS > 0$. Then, if $R^2 + RI - IS > 0$, the trade deals being offered to retailer 2 are now larger, and consequently retailer 2 is better off under the mixed case than under complete exclusive dealing. Note that there are R, I, and S (and in particular, with $R > I$) that satisfy $R^2 + RI - IS > 0$ and $2I^2 + IR - R^2 - RS > 0$ (the condition for no exclusive dealing to be the only manufacturers' equilibrium).

Finally, consider the change from the mixed case to no exclusive dealing (consider fig. 5 and the case of retailer 1). On the one hand, when carrying brand B, retailer 1 now has its demand increased by I, which it enjoys. On the other hand, the trade deals offered to retailer 1 have now changed. The incentives to offer large trade deals have now changed from $(S + R)/(2I + R)$ to $(S + 2R)/2I$, that is, retailer 1 will receive greater trade deals. Then, retailer 1 will be better off under no exclusive dealing than under the mixed case.

This brief discussion then suggests that if the retailer-loyal segment, R, is not too small, the retailers will carry all the products that are being offered to each of them.

VI. Empirical Implications and Conclusions

The results presented above lend themselves to several testable empirical implications. These implications can be seen at two different levels: (i) the impact of intermediaries on trade deals and price promotions, and (ii) the equilibrium channel structure.

In terms of the impact on trade deals and price promotions, these results suggest that, ceteris paribus,[8] one should expect a smaller frequency and depth of consumer price promotions in markets with more intermediaries. Second, one should observe that larger trade deals yield a smaller percentage of retailer pass-through than do smaller trade deals. Third, one should expect trade deals to be more frequent than price promotions. Fourth, in markets with more exclusive dealing, the pass-through of the brands with smaller trade deals should be greater, and the pass-through of the brands with greater trade deals should be smaller. Fifth, one should observe that the likelihood of the

8. One important aspect to control for in an empirical investigation is the heterogeneity in the market conditions among brands (and related issues).

depth and frequency of trade deals increasing, when a market goes from a nonexclusive dealing structure to a structure with exclusive dealing, is greater the larger are the segments of switchers (the consumers who buy at the retailer that has the lowest price) and of price-insensitives (the consumers who always buy the same brand at the same retailer), and the smaller is the segment of retailer-loyals (the consumers who always go to the same retailer and once there buy the product with the lowest price). Sixth, the price probability distribution functions derived both for the exclusive dealing and the nonexclusive dealing case can be directly empirically tested (using a maximum likelihood technique) as in Villas-Boas (1995), which tests the distribution functions presented in Varian (1980) and Narasimhan (1988).

In terms of the equilibrium channel structure, these results show that, in the absence of important service externalities (Telser 1960), the likelihood of observing all retailers carrying all the major brands in the market is greater the larger are the price-insensitive segments (the consumers who always buy the same brand at the same retailer) and the smaller are the retailer-loyal segments (the consumers who always go to the same retailer and once there buy the brand that has the lowest price) and the switcher segments (the consumers who buy the brand with the lowest price in the whole market). Alternatively, one should observe some retailers carrying all the major brands, and some retailers carrying only one of the major brands.

Note finally that in the cases in which the equilibrium channel structure has no exclusive dealing, both manufacturers might have been better off with exclusive dealing.

References

Agrawal, D. In press. Effect of brand loyalty on advertising and trade promotions: A game theoretic analysis with empirical evidence. *Marketing Science*.

Baye, M; Kovenock, D; and Vries, C. G. 1992. It takes two to tango: Equilibria in a model of sales. *Games and Economic Behavior* 4 (October): 493–510.

Conlisk, J.; Gerstner, E.; and Sobel, J. 1984. Cyclic pricing by a durable goods monopolist. *Quarterly Journal of Economics* 99 (August): 489–505.

Coughlan, A., and Wernerfelt, B. 1989. On credible delegation by oligopolists: A discussion of distribution channel management. *Management Science* 35 (February): 226–39.

Green, E., and Porter, R. 1984. Non-cooperative collusion under imperfect price information. *Econometrica* 52 (January): 87–100.

Hart, O., and Tirole, J. 1990. Vertical integration and market foreclosure. *Brookings Papers on Economic Activity, Microeconomics*, pp. 205–76.

Lal, R., and Villas-Boas, J. M. 1993. Competitive price promotions with multi-product retailers. Mimeographed. Berkeley: University of California, Berkeley.

McGuire, T., and Staelin, R. 1983. An industry equilibrium analysis of downstream vertical integration. *Marketing Science* 2 (Spring): 161–91.

Moorthy, K. S. 1988. Strategic decentralization in channels. *Marketing Science* 7 (Fall): 335–55.

Narasimhan, C. 1988. Competitive promotional strategies. *Journal of Business* 61 (October): 427–49.

Raju, J.; Srinivasan, V.; and Lal, R. 1990. The effects of brand loyalty on competitive price promotional strategies. *Management Science* 36 (March): 276–304.
Rao, R. 1991. Pricing and promotions in asymmetric duopolies. *Marketing Science* 10 (Spring): 131–44.
Rotemberg, J., and Saloner, G. 1986. A supergame-theoretic model of business cycles and price wars during booms. *American Economic Review* 76 (June): 390–407.
Sobel, A. 1984. The timing of sales. *Review of Economic Studies* 51 (July): 353–68.
Spengler, J. 1950. Vertical integration and anti-trust policy. *Journal of Political Economy* 58 (August): 347–52.
Srinivasan, K. 1991. Multiple market entry, cost signaling and entry deterrence. *Management Science* 37 (December): 1539–55.
Telser, L. 1960. Why should manufacturers want fair trade? *Journal of Law and Economics* 3 (October): 86–105.
Tenenbaum, M., and Pollard, H. 1963. *Ordinary Differential Equations*. New York: Harper & Row.
Tirole, J. 1988. *The Theory of Industrial Organization*. Cambridge, Mass.: MIT Press.
Varian, H. 1980. A model of sales. *American Economic Review* 70 (September): 651–59.
Villas-Boas, J. M. 1995. Models of competitive price promotions: Some empirical evidence from the coffee and saltine crackers markets. *Journal of Economics and Management Strategy* 4 (Spring): 85–107.