ON THE ECONOMICS OF MANUFACTURERS AND DEALERS: A REEXAMINATION

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ABSTRACT:

This paper provides a model capturing the essential characteristics of the relationship between a manufacturer and dealers in situations where multiple dealers sell a homogeneous product in oligopolistic markets. This includes dealers competing alternatively as Cournot and Stackelberg oligopolists, the manufacturer's use of uniform or differential franchising fees in conjunction with per unit costs charged to dealers, and the manufacturer directly marketing the final product at a cost. The analysis results in a number of propositions concerning alternative dealership structures, the number of dealers, upstream and downstream firm profits, and consumer welfare.

JEL Codes: D43, L22

INTRODUCTION

A considerable literature exists addressing the economic relationships between manufacturers and dealers. Issues such as the optimal price, manufacturer price markup, and the efficiency gains from forward integration into downstream markets have been extensively discussed.

This literature has studied the relationship between upstream and downstream firms under several market structures. Machlup and Taber (1960) develop models in which monopoly manufacturers sell to monopoly dealers. Vernon and Graham (1970), Warren-Boulton (1974), Inaba (1980), and Blair and Kaserman (1980), on the other hand, consider the situation in which upstream monopolists sell inputs to downstream firms operating in perfectly competitive final product markets. Other papers have considered downstream firms selling in monpolistically competitive markets. The studies of Mathewson (1984), Bresnahan and Reiss (1985), Perry and Groff (1985) and Riordan and Sappington (1987) exemplify this approach. Another group of studies assumes dealerships operate as oligopolists, in the context of a differentiated product Bertrand model. This approach is used by Bonanno and Vickers (1988), Lin (1988, 1990), and Shepard (1990).

Additional works have focused on the provision of services and promotional efforts by dealers and the use of resale price maintenance (RPM) by manufacturers. Marvel and McCafferty (1996) provide a comparison of RPM and exclusive territories. Blair and Lewis (1994) investigate the use of RPM in optimal contracts when the manufacturer is uncertain of demand conditions and the level of service by dealers. Butz (1997) concludes that the use of RPM is ideal when the manufacturer is uncertain of demand conditions. The use of RPM in the manufacturer-dealer relationship has been incorporated with an adaptation of the Salop and Stiglitz retail search model by Hamilton (1990).

With the exception of the work of Greenhut and Otah (1976, 1978, 1979) and the surrounding discussion [Haring and Kaserman (1978) and Perry (1978)], a problem that has not received a great deal of attention is the relationship between manufacturers and dealers in situations in which multiple dealers sell a homogeneous product in oligopolistic markets[1]. This situation is probably most closely illustrated by the market for industrial equipment, where due to the similarity of products, dealers can be thought of as price takers rather than price setters in the final product market. The purpose of the present paper is to build a model capturing the essential characteristics of such a market and study manufacturer/dealer relationships in this context. The analysis results in a number of simple propositions concerning alternative dealership structures, the number of dealers, upstream and downstream firm profits, and consumer welfare.

Section II lays out the basic design of the model. The model assumes a monopolistic manufacturer of a product selling the product to multiple dealers. Dealers are assumed to compete alternatively as Cournot and Stackelberg oligopolists in the resale market. Derived dealer demand and the manufacturer markup over marginal cost are found under both retail market structures.

As an alternative in Section III the paper develops a model in which the manufacturer directly markets the product in the final product market at a cost. In this section we solve for the minimal number of dealerships necessary for the use of dealerships to be more profitable than the direct marketing scheme.

The fourth section of the paper studies the case in which the manufacturer sells franchises to the dealerships to recapture the loss of profits due to double marginalization. We consider a uniform franchise fee across to all Cournot dealers, a differential fee between Stackelberg leaders and followers, and a uniform fee to Stackelberg leaders and followers. Section V summarizes our results.

A SIMPLE DISTRIBUTION MODEL

Assume a product X is manufactured by a monopolist.[2] Constant unit manufacturing costs are denoted C_M. The monopolist distributes the product via a network of N dealerships, to which it sells at a unit price P_M. The dealers in turn distribute the product to the final market. A fixed proportion production function is assumed at the dealer level.[3] For further simplicity, production is normalized so that one unit produced by the manufacturer equals one saleable unit at the dealer level. Inverse demand for the final product is assumed to be

$$P_R = A - \frac{X}{B} = A - \frac{\Sigma X_i}{B}, \tag{1}$$

where X_i is the sales of the i^{th} dealership and P_R is the retail price.[4] The linear form of the model has been chosen for ease of exposition.

The economics of distribution in the above setup can be solved as a two-step process. First, the dealers compete for sales resulting in a subgame equilibrium.

Total dealer derived demand from this competition is then used by the manufacturer to determine the optimal manufacturer's markup of price over marginal cost. This price determines both the manufacturer's and dealers' profit.

For simplicity, we assume that the only cost to the dealers is the price of the manufactured product to be resold. Product distribution costs can be assumed for the dealer without altering the substance of the analysis. However, if such costs are introduced they must be restricted to be less than any marketing costs incurred by the manufacturer directly marketing the product. Otherwise the profit maximizing decision for the manufacturer would be to vertically integrate, bypassing the use of dealerships altogether.

We consider both Cournot and Stackelberg competition between dealers. Cournot dealers make their output decisions simultaneously, while Stackelberg dealers make their output decisions sequentially. With the Cournot version of the model, profits of the i^{th} firm, $i = 1, \ldots, N$, are[5]

$$\Pi_i = (P_R - P_M)X_i = (A - \frac{\Sigma X_i}{B})X_i - P_M X_i. \tag{2}$$

Maximizing (2) with respect to X_i results in the firm and market output for the Cournot version of the model. These are, respectively, given by

$$X_i = \frac{B(A - P_M)}{N+1}, \quad X = \frac{NB(A-P_M)}{N+1}. \tag{3}$$

With Stackelberg competition between dealers we arbitrarily assume that firm one is the leader with the remaining N-1 firms following. The model can easily be extended to the case of a K firm leadership cartel with a fringe consisting of $N - K$ followers. Profit conditions are as in (2). Followers are assumed to compete in Cournot given the leader's output. Maximizing (2) results in an equilibrium output for the typical follower expressed as a function of the leader's output

$$X_F = \frac{B(A - P_M) - X_L}{N}. \tag{4}$$

Use of (4) in the leader's profit function and maximizing with respect to X_L yields the Stackelberg equilibrium output for the leader, representative follower, and total market[6]:

$$\begin{aligned} X_L &= \frac{B(A-P_M)}{2}, \\ X_F &= \frac{B(A-P_M)}{2N}, \\ X &= X_L + (N-1)X_F = \frac{(2N-1)B(A-P_M)}{2N}. \end{aligned} \tag{5}$$

Equations (3) and (5) show the derived demand for the manufacturer's output for the two retail market structures. The derived demand in the case of a monopoly retailer can be determined from either equation under the assumption $N = 1$, while derived demand with a perfectly competitive product market can be determined under the assumption $N \rightarrow \infty$. The manufacturer's profits can be expressed using (3), (5), and the manufacturer's price cost margin. For the Cournot and Stackelberg retail structure, these are[7]

respectively

$$\Pi_{Cournot} = \frac{NB(A - P_M)(P_M - C_M)}{N+1}, \tag{6}$$

$$\Pi_{Stackelbeg} = \frac{(2N-1)B(A - P_M)(P_M - C_M)}{2N}.$$

Maximizing (6) with respect to P_M results in the manufacturer's optimal price. Theorem 1 follows.

Theorem 1: Assuming linear inverse demand $P_R = A - X/B$ and unit manufacturing cost C_M, the optimal manufacturer's price for a monopoly, perfectly competitive, Cournot, and Stackelberg dealership structure is $P_M = (A + C_M)/2$.

Theorem 1 states that for manufacturers selling a homogeneous product to independent dealerships, the optimal manufacturer's price can be set independent of the structure of the market in which the dealers sell. Although understood, this result has not been explicitly stated in the literature. Note that dealers cannot earn a profit by reselling the manufacturer's product unless $A > C_M$. This, in turn, implies that $A + C_M > 2C_M$. Theorem 1, therefore, also shows the manufacturer is pricing its product above marginal production cost C_M. This is similar to the results of Bonanno and Vickers (1985) who find that in a differentiated product duopoly, vertical separation of manufacturers and dealers leads to the manufacturer pricing above marginal cost.

DIRECT MARKETING VERSUS THE USE OF DEALERSHIPS

As an alternative to the use of dealerships, consider the case in which the manufacturer markets the product directly to the public, the case of forward vertical integration into the product market. We assume that due to learning by doing, proximity to customers, or otherwise dealerships have an absolute cost advantage in marketing the manufacturer's product. Any diseconomies of scale incurred by the dealers selling downstream will be assumed outweighed by their comparative advantage in marketing the final product. Direct marketing therefore will be assumed to require the manufacturer to incur a unit marketing cost, *k,* while for simplicity dealerships will again be assumed to incur no marketing or distribution costs.

Manufacturer's profits from directly marketing the product to the downstream market are

$$\Pi_{MFG} = (P_R - C_M - k)X = (A - \frac{X}{B})X - (C_M + k)X. \quad (7)$$

Maximizing (7) with respect to X leads to the optimal output for the direct marketing monopoly manufacturer, $X = B(A - C_M - k)/2$.

Use of this output in (1) results in the retail price for the direct marketing scheme. Use of (3), (5) and the optimal manufacturer's price in Theorem 1 results in the retail price for the Cournot and Stackelberg dealership structures. These prices are, respectively,[8]

$$P_{R,Direct} = \frac{A + C_M + k}{2}, \quad (8)$$

$$P_{R,Cournot} = \frac{(N+2)A + NC_M}{2(N+1)},$$

$$P_{R,Stack} = \frac{(2N+1)A + (2N-1)C_M}{4N}.$$

Equations (8) show that if there are no additional costs to marketing the product directly (k = 0), the direct market retail price will be less than that of either the price charged by the Cournot dealers or the Stackelberg dealers. This is in the spirit of Perry and Groff (1985) who argue that forward integration by manufacturers into downstream markets leads to lower product prices and greater consumer welfare than through the use of dealerships. Our results also show that the increase in consumer prices due to markups extracted by dealers (the problem of double marginalization) decreases as the number of dealerships increases, that is, as competition at the downstream stage intensifies. Finally, note that if there are additional direct marketing costs incurred by the manufacturer that are not incurred by the dealers, retail prices may be lower when dealers are used. This depends on the value of k and the number of dealerships N.

The manufacturer's profits using direct marketing are obtained using (7). For the case of Cournot and Stackelberg dealerships, these profits are derived using (3), (5), Theorem 1, and expressing manufacturer profits as $\Pi_{Mfg} = X(P_M - C_M)$. These profits are, respectively,

$$\Pi_{Direct} = \frac{B(A - C_M - k)^2}{4}, \quad (9)$$

$$\Pi_{Cournot} = \frac{N}{N+1}\frac{B(A - C_M)^2}{4},$$

$$\Pi_{Stack} = \frac{2N-1}{2N}\frac{B(A - C_M)^2}{4}.$$

Equations (9) show that when there are no additional costs to marketing directly to consumers compared to using dealerships (k=0), profits to the manufacturer are higher under direct marketing than under either dealership structure.

These equations also show that the manufacturer's profits under both the Cournot and Stackelberg dealership structure increase toward the profits under direct marketing as the number of dealerships increases.

For values of $k > 0$, the possibility exists that the manufacturer's profits using dealerships is greater than with direct marketing. Assuming that manufacturer's profits using dealers are higher than using direct marketing leads to the following theorem.

Theorem 2: If there are direct marketing costs, $k > 0$, using a sufficient number of dealerships results in greater manufacturer profits than with direct marketing. This minimum number of dealerships is given by

$$N_{Cournot} > \frac{(A - C_M - k)^2}{2k(A - C_M) - k^2}, \quad N_{Stack} > \left(\frac{1}{2}\right)\frac{(A - C_M)^2}{2k(A - C_M) - k^2}.$$

Differentiating the right-hand side of the inequalities in Theorem 2 with respect to k reveals that $\partial N_{Cournot}/\partial k < 0$ and $\partial N_{Stack}/\partial k < 0$. This means that increasing the manufacturer's direct marketing costs decreases the minimum number of dealerships necessary for the use of dealerships to be preferred to direct marketing. However, directly comparing profits with Cournot dealerships and Stackelberg dealerships shows that profits are greater in the Stackelberg case as long as $N > 1$. This means that for a given number of dealerships, the manufacturer prefers to have one (or more) large dealership and a fringe of small dealers to N equally sized dealers. This is consistent with casual observation of markets such as the automobile market in urban areas.

CAPTURING PROFITS USING FRANCHISES

Next, we consider the scenario where the manufacturer charges each dealer a franchise fee to be able to sell the product. Such a fee is similar to the entry fee considered by Blair and Kaserman (1980)[9]. The manufacturer continues charging per unit costs of P_M, so that total costs charged to the dealer amount to a two-part tariff. We assume that a dealer will remain in the market as long as it earns non-negative profits.

Suppose the manufacturer is able to charge a franchise fee equal to the profits of each dealer. For the Cournot dealer case, this is a uniform franchise fee. In the Stackelberg case, the manufacturer will charge a higher franchise fee to the leading dealership and a lesser franchise fee to the Cournot fringe. The manufacturer's profits can be expressed by including the joint franchise fees, F, in equation (6). For the Cournot and Stackelberg retail structures, the manufacturer's respective profits are[10]

$$\Pi_{Cournot} = \frac{NB(A - P_M)(P_M - C_M)}{N+1} + F_{Cournot}, \tag{10}$$

$$\Pi_{Stack} = \frac{(2N-1)B(A - P_M)(P_R - C_M)}{2N} + F_{Stack},$$

where $F_{Cournot} = \dfrac{NB(A-P_M)^2}{(N+1)^2}$ and

$$F_{Stack} = \frac{B(2N-1)(A-P_M)^2}{4N^2}.$$

Maximizing (10) with respect to P_M results in the manufacturer's optimal price. Theorems 3 and 4 follow.

Theorem 3: Assuming linear inverse demand $P_R = A - X/B$ and unit manufacturing cost C_M, the optimal manufacturer's prices with franchising for monopoly, Cournot, and Stackelberg dealership structures is $P_M = [(N-1)A+(N+1)C_M] / 2N$ and
$P_M = [(N-1)A + NC_M] / (2N-1)$ respectively.

Theorem 4: Assuming linear inverse demand $P_R = A - X/B$ and unit manufacturing cost C_M, the optimal manufacturer's per dealer franchising fees for Cournot and Stackelberg dealership structures are $F_{Cournot} = B(A-C_M)^2 / 4N^2$, $F_{Stack\ leader} = (BN/4)\,[(A-C_M)/(2N-1)]^2$ and $F_{Stack\ follower} = [B(A-C_M)^2]/[4(2N-1)^2]$.

It is evident from Theorem 3 that when there is a monopoly dealership, that is when N = 1, the manufacturer will use marginal cost pricing, collecting all profits in the franchise fee[11]. This is a standard result shown in numerous textbooks. However, the manufacturer's price, P_M, is increasing in the number of dealers, *N*. In this case, then, the franchisor prices the product above marginal cost. Moreover, Theorem 3 suggests that if dealerships act as price-taking oligopolists, the degree of mark-up above marginal cost depends on the number of franchises granted.

Note that for a given *N*, the manufacturer charges a lower price to dealers in a Cournot structure compared to dealers in a Stackelberg structure. Furthermore, the manufacturer's prices are lower in both dealership structures compared to the case when the manufacturer does not charge franchise fees (see Theorem 1). Notice in Theorem 4 that franchise fees also fall as *N* increases. Increased competition in the retail market decreases dealer profits and the ability of the manufacturer to extract profits through granting franchises. For a given number of dealers, *N*, the franchise fee charged to a dealer in a Cournot dealership structure is between the franchise fees charged to the leader and follower(s) in a Stackelberg structure. This suggests that a manufacturer interested in increasing the number of dealerships may prefer a Stackelberg dealership structure, as it can entice possible 'follower' firms with low franchise fees.

Maximizing (10) with respect to manufacturer price results in total manufacturer profits $B(A-C_M)^2/4$. Use of franchise fees is therefore an alternative to vertical integration as a means of increasing manufacturer's profits. Although known in the context of a monopoly selling to downstream Cournot firms, our results show that this also holds for a monopoly manufacturer selling to downstream Stackelberg firms. The manufacturer captures all downstream profits, provided it uses a non-uniform franchise fee. Moreover, this profit is not a function of the number of dealers.

Now suppose that the manufacturer charges a uniform fee to all dealers in a Stackelberg dealership structure. This is a reasonable scenario given that a number of manufacturers use uniform franchise fees. This situation might arise when the manufacturer believes all dealers operate under the same expectations, but one dealer emerges as having superior information, in the sense of knowing its competitors' reaction functions. In this case, the individual dealer's franchise fee will be equal to the profits of one of the Cournot fringe followers. It is not possible to charge a higher fee as this would drive the fringe dealers out of the market. The manufacturer's profit is

$$\Pi_{Stackelberg} = \frac{(2N-1)B(A-P_M)(P_M-C_M)}{2N} + \frac{NB(A-P_M)^2}{4N^2}, \tag{11}$$

where the second term is the joint franchise fee. Maximizing (11) with respect to P_M results in the manufacturer's optimal price. Theorem (5) follows.

Theorem 5: Assuming linear inverse demand $P_R = A - X/B$, unit manufacturing cost C_M, and a uniform franchise fee for all dealers in a Stackelberg dealership structure, the manufacturer's optimal price is $P_M = [2(N-1)A + (2N-1)C_M] / (4N-3)$ with a per dealer franchise fee of $F_{Stackelberg} = [B(A-C_M)^2(2N-1)^2] / [4N^2(4N-3)^2]$.

Under this franchise scheme, the franchise fees fall and the price the manufacturer charges per unit rise as the number of dealerships increase. This result is similar to that found with Theorem 3. However, the franchise fees are lower and the price the manufacturer charges is higher under this scheme than in either the Cournot dealership structure with a uniform franchise fee or the Stackelberg structure charging different franchise fees.

Using the Theorem 5 and equation (11), one can derive the following.

Theorem 6. Assuming linear inverse demand $P_R = A - X/B$, unit manufacturing cost C_M, and the use of uniform franchise fees, the manufacturer's profit for Stackelberg dealership structures is $[B(2N-1)^2(A-C_M)^2] / 4N(4N-3)$.

It is evident that the manufacturer earns lower profits under this franchise scheme than by capturing all dealership profits through franchising as in the previous schemes. Blair and Kaserman (1980) state that lump-sum franchise fees may encounter informational problems if the manufacturer is not certain of the nature of the demand curve in the final market. Our results suggest that, even if the manufacturer is knowledgeable of the final-market demand, the manufacturer's profits can suffer due to informational problems arising from unawareness of the nature of the retail competition. However, the manufacturer's profit still increases as the number of dealerships, N, increases and approaches $B(A-C_M)^2/4$.

It is worth noting how the use of franchising affects the retail prices charged consumers. To simplify the discussion, assume that the manufacturer has no direct marketing costs, i.e. $k = 0$. If the manufacturer does not use franchising, the consumers pay the lowest retail price when the manufacturer retails directly. See equation (8) and the discussion following.

Use of (3), (5) and the optimal manufacturer's prices in Theorem 3 result in the retail price for the Cournot and Stackelberg dealership structures assuming the manufacturer charges a non-uniform franchise fee. These are

$$P_{R,Stack} = P_{R,Cournot} = P_{R,Direct} = \frac{A + C_M}{2}. \tag{12}$$

Use of (3), (5) and the manufacturer price in Theorem 5 obtains the retail price for the Stackelberg structure assuming a uniform franchise fee charged to both Stackelberg leaders and followers[12]

$$P_{R,Stack} = \frac{A(4N^2 - 2N - 1) + C_M (2N - 1)^2}{2N(4N - 3)}. \quad (13)$$

Equation (8) shows that without franchise fees, retail prices are higher than with direct marketing. Equation (12), however, shows that the use of franchise fees sufficient to capture all dealer profits results in the same low price as in the case of vertical integration. The fixed fees charged by the manufacturer allow the manufacturer to lower per unit wholesale prices, which in turn causes the retail price to fall. As a result, consumer welfare is increased in the case of non-uniform franchise fees.

The results are somewhat different when the manufacturer charges a uniform franchise fees across Stackelberg dealers. A comparison of (13) and (12) reveals that the price in (13) will be greater than the price in (12) if $A > C_M$, which must hold for firms to earn non-negative economic profits. Equation (13) shows that if the manufacturer fails to capture the entire profits from the first mover, the equilibrium Stackelberg retail price will be higher than otherwise. Consumer welfare will correspondingly decrease.

CONCLUDING REMARKS

The analysis in this paper has led to several conclusions concerning the costs and benefits of using dealers competing under alternative market structures. In our estimation the three most important are: 1) without franchise fees manufacture prices to dealers will be independent of the market structure under which dealers compete; 2) if the manufacturer incurs a cost of direct marketing, a sufficient number of dealers can make up for any profit disadvantage the manufacturer may experience due to the use of dealerships; 3) in addition to increasing manufacturer profits, the use of franchise fees by the manufacturer in most instances results in lower retail prices and increased consumer welfare. The exception to point three is the case in which the manufacturer charges a uniform franchise fee to all retail firms engaged in Stackelberg competition.

ENDNOTES

1. Our paper does not consider itself with the analytically intractable situation of a manufacturer selling through multiple firm differentiated Bertrand dealers. For a discussion of manufacturers and Bertrand Duopoly dealers, see Lin (1988).

2. A table listing the notation, with associated definitions, used throughout the paper is provided in the appendix.

3. This is similar to the simplification used by Greenhut and Otah (1979).

4. The inverse demand function gives the price resulting from the aggregate demand of a good. More formally, "At any given level of aggregate demand $\bar{x}$, the *inverse demand function* $P(\bar{x}) = x^{-1}(\bar{x})$ gives the price that results in aggregate demand of $\bar{x}$. That is, when each consumer optimally chooses his demand for [the good] at this price, total demand exactly equals $\bar{x}$." (Mas Collel et al., 1995) In equation (1) the coefficient on X is negative as the relationship between quantity demanded (X) and retail price (P_R) is assumed to follow the standard definition of the law of demand.

5. The profit for each Cournot dealership is the difference between the price it sells the product (retail price P_R) and its cost of buying the product from the manufacturer (P_M) multiplied by the number of units sold (X_i). This profit calculation could also be viewed as the contribution-margin multiplied by units sold.

6. The last equation presents the total market output as the sum of the outputs of the Stackelberg leader and the (n-1) followers.

7. The manufacturer's profit is a calculated by multiplying its contribution-margin ($P_M - C_M$) and the number of units sold X. Thus $\Pi_{Cournot}$ is the contribution margin multiplied by equation (3) and $\Pi_{Stackelberg}$ is the contribution margin multiplied by the last equation in (5).

8. The retail prices with dealerships are derived by using P_M as stated in Theorem 1 and the appropriate output (equation (3) for Cournot, (5) for Stackelberg) in the retail inverse demand function (equation (1)).

9. Note that our analysis is restricted to the case of a single contractual control between manufacturer and dealer. We do not, for example, consider the use of a combination strategy of a fixed franchise fee coupled to a tying contract by the manufacturer. This simplification allows us to concentrate on the relationship between dealer strategy in the final product market and manufacturer profits.

10. The profit equations are similar to those in equation (6) with the addition of the joint franchise fees, which are equal to the dealers' profits in the respective retail structures. See endnote 7 for further explanation.

11. This result only holds when there is no uncertainty on the part of the franchisor concerning final product demand.

12. The retail price is derived by using the P_M as stated in Theorem 5 in the output stated in equation (5). This is then used in the retail inverse demand function as listed in equation (1).

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APPENDIX

Table 1
Definitions of the notation used in the modeling.

<u>Regarding the manufacturer</u>	
P_M	Unit price charged by the manufacturer
C_M	Constant unit manufacturing costs
X	Output produced by the manufacturer
k	Cost per unit of direct retailing rather than using dealerships
F	Joint franchise fees charged of dealerships
Π_{Direct}	Manufacturer profits from directly retailing rather than using dealerships
$\Pi_{Cournot}$	Manufacturer profits with Cournot dealerships
$\Pi_{Stackelberg}$	Manufacturer profits with Stackelberg dealerships
<u>Regarding the Retail Market</u>	
P_r	Price in the retail market
Π_i	Profits of the i^{th} dealership
With Cournot dealerships	
X_i	Sales of output by the i^{th} dealership
With Stackelberg dealerships	
X_L	Sales of output by the leader
X_F	Sales of output by a representative follower