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Forcing, Maximum Resale Price Maintenance,
Brand Discounts and Aggregate Rebates

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Capturing Strategic Rent: Full-line Forcing, Maximum Resale Price Maintenance, Brand Discounts and Aggregate Rebates

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Abstract

This paper examines the implications of a retailer's shelf space stocking decisions on the optimal marketing strategies of an upstream multi-product monopolist. When the retailer's opportunity cost of shelf space is known, full-line forcing, brand discounts, and maximum resale price maintenance are sufficient to achieve the monopolist manufacturer's first best profit. When these strategies are adopted, the retailer's profit is reduced to the scarcity rents obtainable on her shelf space. The additional downstream profit to be made by pitting one brand versus another is eliminated. When the retailer's opportunity cost of shelf space is unknown, the use of aggregate rebates can act as a screening device to maximize channel profit.

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I Introduction

Retailers derive their bargaining strength vis a vis upstream suppliers partly through their product selections. Sometimes space considerations limit the number of items that any one retailer can carry. In this case a downstream firm's decision to stock one product necessarily precludes her from stocking another. Thus manufacturers within and across industries are forced to compete to secure retailer patronage.

However shelf space does not have to be scarce to be valuable. A retailer may still earn positive rent as long as there exists at least two brands per product class. The opportunity cost of stocking one brand includes the foregone profit from the reduced sales of all other substitute brands. An item will be carried only if its incremental profit is non-negative. In other words a product will not be stocked if the retailer can improve her profitability by dropping it from her line. She cannot be forced to accept less than her opportunity cost on any brand that she carries.

This paper examines the implications of a retailer's shelf space stocking decisions on the optimal marketing strategy of an upstream firm. The focus is on a multi-product monopolist who produces a line of goods in a particular product class. I find that when the retailer's opportunity cost of shelf space is known, full-line forcing, brand discounts, and maximum resale price maintenance are sufficient to achieve the monopolist manufacturer's first best profit, i.e. the profit the upstream firm could make if it were vertically integrated. When these strategies are adopted, the retailer's profit is reduced to the scarcity rents obtainable on her shelf space. The additional downstream profit to be made by pitting one brand versus another is eliminated. When the retailer's opportunity cost of shelf space is unknown, the use of aggregate rebates can act as a screening device to maximize channel profit.

From the manufacturer's perspective, the crux of the problem is that a retailer earns positive rent on every product that she stocks. The sources for this rent can be split into two components. The first component is the rent attributable to the scarcity of her shelf space. Stocking a particular product precludes stocking another. The scarcity rent is the foregone profit from the most preferred excluded product. The second component, the strategic rent, represents the foregone profit from reduced sales of substitute brands. Any individual manufacturer will be unable to affect the scarcity rent. However the latter component can be eliminated by an appropriate supply contract, whenever a single manufacturer produces the multiple brands.

Maximum resale price maintenance denotes a supplier contract that specifies a retail price ceiling. Under this arrangement, a retailer may not sell the particular product for more than a pre-specified amount. A multi-product manufacturer can utilize this practice to force the retail markup on each of his products to be zero. Strategic rent is thereby eliminated.

Alternatively, a multi-product manufacturer can employ full-line forcing to achieve the

same end. In this context, full-line forcing is taken to mean one of two things. It may mean that the manufacturer literally requires retailers either to stock each of his products or none at all. On the other hand, it may mean that the manufacturer has structured the incentives in his contract in such a way that de facto full line forcing is achieved. In either case, the retailer will be unable to collect any strategic rent since carrying a subset of the manufacturer's products is not feasible.

Brand discounts are a third strategy available to the multi-product manufacturer. The retailer's payment is made conditional on the number of brands she carries. The more brands the retailer stocks, the greater her discount. Thus the retailer can be induced to accept the entire product line. Alternatively, one can think of the retailer as being penalized if the entire line is not stocked. With an appropriate choice of contract, strategic rent can be eliminated.

Finally, aggregate rebates can be employed. This is the practice whereby downstream firms receive a rebate, or additional discount, on total purchase volume orders which exceed a pre-determined level. Purchases of all brands in the upstream firm's product line can be summed to qualify for the rebate. In this case, if a retailer considers not stocking one of the brands, she must take into account the possibly foregone rebate offer. In many cases the upstream firm will be able to structure the incentives in such a way as to eliminate all strategic rent.

This work is closely related to the literature on vertical control and channel profit maximization. In the single product case, Mathewson and Winter (1984), Jeuland and Shugan (1983), and Moorthy (1987), have concluded that a manufacturer can eliminate successive monopoly markups by an appropriate choice of a quantity discount schedule or a two - part tariff. It is also well known that retail price ceilings could be employed to achieve the same result. Here the analysis is extended to consider multiple products. One difference is that while price ceilings continue to be sufficient to maximize channel profit, brand specific two - part tariffs alone will not be. Instead, when shelf space opportunity costs are known, the monopolist manufacturer maximizes channel profit either by setting a single fixed fee for all of his products, or if he does set brand specific fixed fees, by offering his retailers further incentives in the form of rebates or brand discounts.

Earlier work on full-line forcing has focused on price discrimination and extension of monopoly or leverage theories. Recent papers addressing the latter case include Whinston (1990), and Carbajo et al (1990). Under the price discrimination theory, full-line forcing allows a firm to extract more surplus from heterogeneous consumers, Bowman (1957), and homogeneous consumers, Burstein (1960) and Blair and Kaserman (1978). Here I ignore upstream strategic issues, and hence the leverage theory, by assuming a lone manufacturer. Instead full line forcing is employed to eliminate a retailer's strategic rent and thus is closest

in spirit to Burstein's "all or nothing choice" of prices.

To my knowledge, the formal theoretical literature has not considered brand discounts or aggregate rebates. However, it has been conjectured that these practices may be anti-competitive in that by inducing retailers to stock more of their products, manufacturers with broad product lines can gain an unfair advantage over producers with narrow product lines.¹ This paper develops an alternative explanation which suggests that an upstream firm would employ the practices even in the absence of a rival.

The rest of the paper is organized as follows. Section ii presents the model and notation. Section iii derives the source of a retailer's claim on channel profits. This is termed 'strategic rent'. Section iv considers alternative strategies that an upstream multi-product monopolist can employ to reduce this claim. In particular I discuss full-line forcing, brand discounts, aggregate rebates, and maximum resale price maintenance. Section v extends the basic model by allowing retailers to differ in their opportunity costs of shelf space. Section vi concludes the paper.

II The Model

Most contracts between manufacturers and their retailers involve terms which are nonlinear. A particularly simple nonlinear contract is a two part tariff. Here a fixed fee is paid for the right to stock a manufacturer's product, the retailer can then buy the product at a constant per - unit price. Alternatively, one might observe a two - block tariff. A per - unit price is charged for all units up to a certain quantity. After that the per - unit price changes and the new price is in effect for all units thereafter. In an n - block tariff, the per unit price changes n-1 times. Sometimes manufacturers publish a price list. Discounts are then given if certain quantity thresholds are reached. For instance, when a threshold is reached, a percent discount is applied to the list price to give a new base price. This new base price may apply either to all units, an all units quantity discount, or it may apply to just those units beyond the threshold, an incremental quantity discount.

Many reasons have been given for the various forms of nonlinear contracts. These include (1) retailer buyer power, whereby a large retailer is able to obtain a lower trade price, (2) cost related justifications, i.e. there is a fixed cost of processing an order, or there are transportation economies of scale, (3) transference of inventory costs, (4) price discrimination between buyers with different valuations for the upstream firm's product, and (5) channel coordination to avoid a successive markup distortion.

In this paper I wish to focus exclusively on channel coordination when the upstream firm produces multiple products. As such the model will be stylized to rule out the first

¹See Merkin and Williams (1984), at pp. 168, and the Monopolies and Mergers Commission (1981b).

four possibilities. Thus I consider a monopolist manufacturer who produces two goods with constant marginal costs c_1 and c_2 .² The upstream firm sells his products to a downstream retailer who is a monopolist in her local market. The retailer can choose to stock both products, either one alone, or neither. The goods are partial substitutes in the sense that an increase in the retail price of one leads to an increase in consumer demand for the other.

The downstream monopolist selects the brands she will stock and sets prices to maximize her profit. These decisions will depend on the specification of the manufacturer's contract. With perfect foresight the upstream firm will choose his supply terms to maximize his profit, taking into account the downstream firm's optimal behavior. These terms are offered on a take-it or leave-it basis. Thus individual negotiations with local retailers is assumed to be too costly for a manufacturer who sells nationally.

I will further assume that downstream entry is restricted in the short run, and that the opportunity cost of a slot of shelf space can be taken as exogenous. There are a limited number of shelf space slots, and a one to one correspondence exists between the number of products stocked and the number of used slots. Finally I will approximate upstream nonlinear pricing by restricting attention to supply contracts with fixed fees.³

Let the retail prices for substitute goods 1 and 2 be denoted by P_1 and P_2 . Retail demand functions $D^1(P_1, P_2)$, $D^2(P_1, P_2)$ are differentiable, downward sloping in own price, and upward sloping in the other good's price. Let (w_1, F_1) and (w_2, F_2) represent the wholesale price and fixed fee specified by the manufacturer if goods 1 and 2 are stocked independently. If both goods are stocked, let the manufacturer's terms be given by (w'_1, w'_2, F_{12}) . In this latter case the retailer's profit is given by

$$\pi^{12} = (P_1 - w'_1)D^1(P_1, P_2) + (P_2 - w'_2)D^2(P_1, P_2) - F_{12}.$$

I will assume that the second order conditions for profit maximization hold, i.e. the Hessian matrix of the retailer's profit function is negative semi-definite.

When good 2 is not carried, the demand for good 1 is given by $D^1(P_1, \infty)$ where the price of good 2 is denoted by infinity. The retailer's profit is then $\pi^1 = (P_1 - w_1)D^1(P_1, \infty) - F_1$. I will assume that demand is downward sloping and that the profit function is concave in P_1 . Define similar notation in the case where good 1 is not stocked.

Since shelf space is limited, a retailer who carries the upstream monopolist's products necessarily foregoes carrying someone else's goods. These other manufacturers are assumed to operate in perfectly competitive industries, and they produce products which are unrelated to the monopolist's brands. I summarize their presence by letting s be the foregone profit to the retailer of her most preferred excluded product. It is the opportunity cost of a shelf

²This analysis easily generalizes to n goods with the same qualitative results.

³In this model, fixed fee contracts are sufficient to maximize the manufacturer's profit. Thus more general supply contracts are not needed.

space slot. Thus the retailer's reservation profit when she stocks both brands is given by $\max\{\pi^1 + s, \pi^2 + s, 2s\}$. This represents the profit she could make if she dropped good 1, good 2, or both products from her shelf. When this reservation profit exceeds $2s$, the retailer is said to earn strategic rent.

III Two - part tariff contracts and Strategic Rent

The task of this section is to show that the manufacturer does not maximize his profit by setting brand specific two - part tariffs alone. Thus a contract which specifies (w_1, F_1) , (w_2, F_2) , and $(w_1, w_2, F_1 + F_2)$ does not yield the manufacturer's first best profit. The retailer earns strategic rent by pitting the manufacturers' two brands against one another. She does this by threatening not to carry his full - line of products.

Suppose the retailer stocks both brands. She will maximize π^{12} with respect to P_1, P_2 . Let $\tilde{P}_1 = \tilde{P}_1(w_1, w_2)$, and $\tilde{P}_2 = \tilde{P}_2(w_1, w_2)$ be the solution. Define the maximized profit to be $\Pi^{12} = \pi^{12}(\tilde{P}_1, \tilde{P}_2, F_{12})$.

Now suppose the retailer only stocks good 1. Her problem is to maximize π^1 . Let $\bar{P}_1 = \bar{P}_1(w_1)$ be the solution and define $\Pi^1 = \pi^1(\bar{P}_1, F_1)$ to be the corresponding maximized profit. Define similar notation in the case where only good 2 is sold.

The downstream firm will choose to carry the set of products which maximizes her profit taking into account the opportunity cost of stocking each brand. In other words her decision will be given by $\max\{\Pi^{12}, \Pi^1 + s, \Pi^2 + s, 2s\}$. Her profit can not be driven below $2s$, which is her scarcity rent on two slots of shelf space. On the other hand the retailer's profit may be greater than $2s$ if the manufacturer is unable to capture all of her strategic rent.

The upstream firm's first best profit is defined to be the profit it would earn on goods 1 and 2 if it were vertically integrated. I will assume that the resulting maximized channel profit obtained by selling both brands exceeds the opportunity cost of the two shelf space slots. I now ask whether a vertically dis-integrated manufacturer can achieve his first best profit via arms length contracting. The terms of any such contract will be set to meet two objectives: channel profit maximization and extraction of the retailer's surplus. Clearly channel profit is maximized when the wholesale prices are set equal to production marginal cost, $w_i = w'_i = c_i$. The remainder of the paper is concerned with the latter objective: capturing strategic rent.

This section considers a manufacturer who charges a fixed fee for each of his products. If the retailer decides to carry both brands, she must pay the sum of the fixed fees. Consider the manufacturer's problem. To induce the retailer to carry his full line, he must allow her to earn at least as much profit by carrying both products as she would earn by carrying only one brand, and at least as much profit by carrying both products as she would earn

by selling neither. In other words it must be the case that $\Pi^{12} \geq \max\{\Pi^1 + s, \Pi^2 + s, 2s\}$. However the following proposition will now demonstrate that the restricted contract set is unable to extract fully the retailer's surplus.

Proposition 1 *Brand specific two - part tariff contracts are not sufficient to maximize the manufacturer's profit.*

Proof: Suppose they were sufficient. Then

$$w_i = c_i, \Pi^{12} = 2s, \Pi^{12} \geq \max\{\Pi^1 + s, \Pi^2 + s, 2s\}$$

This implies that $\Pi^1 + \Pi^2 \leq 2s$ and hence $\Pi^1 + \Pi^2 - \Pi^{12} \leq 0$. Writing this last equation explicitly gives

$$\sum_{i=1}^2 ((\bar{P}_i - c_i) D^i(\bar{P}_i, \infty) - (\tilde{P}_i - c_i) D^i(\tilde{P}_i, \tilde{P}_j)) \leq 0 \quad (1)$$

where the restriction $F_1 + F_2 = F_{12}$ is imposed. But examining component by component it is seen that

$$(\bar{P}_i - c_i) D^i(\bar{P}_i, \infty) \geq (\tilde{P}_i - c_i) D^i(\tilde{P}_i, \infty) > (\tilde{P}_i - c_i) D^i(\tilde{P}_i, \tilde{P}_j)$$

The first inequality is true by the definition of \bar{P}_i . Holding the price of good i constant, the second inequality follows by observing that sales of good i must rise when good j is not stocked. Similar reasoning holds for good j . Combining these results contradicts equation 1. Hence the manufacturer's first best profit is not achieved. *Q.E.D.*

The retailer's bargaining strength arises from her discretion over brand choice. She can simply refuse to stock either good 1 or 2, or both. Because these goods are substitutes, their individual sales are subject to the availability of the other. In addition to the new sales it attracts, stocking a second brand induces some consumers to switch from buying the first brand. When both products are stocked, the total sales of the product class will be less than the sum of the sales if each brand were stocked alone. This fact may work to the advantage of the retailer. If restricted to brand specific two - part tariffs, the most F_i can extract is good i 's marginal contribution to the retailer's profit. The retailer earns strategic rent.

IV Capturing Strategic Rent

The previous section proposed that a multi-product manufacturer would be unable to recover fully the channel profits generated by his products when he is restricted to selling to a downstream retailer via brand specific two - part tariff contracts. This result is somewhat surprising since intuition might suggest that this type of contracting would yield an outcome

equivalent to that which would obtain if the firms were vertically integrated. Since fixed fees can be used to transfer surplus between industries, the double marginalization problem can be avoided.

However the intuition is valid only for a single product industry. When there are multiple brands per product class, a retailer may earn positive strategic rent. Her bargaining strength arises because she can selectively choose which brands to stock. An item will be carried only if its incremental profit is non - negative. In other words a product will not be stocked if a retailer can improve her profitability by dropping it from her line. The crucial insight is that adding a product to her shelf imposes an opportunity cost on her which is equal to the sum of the foregone profit from her most preferred excluded product and the foregone profit from the reduced sales of any substitute brand that she carries.

Therefore in order to extract more of the surplus from his retailers, the upstream firm will need to resort to alternative supply contracts. In this section I examine full - line forcing, maximum resale price maintenance, brand discounts and aggregate rebates. All yield outcomes which are equivalent to vertical integration.

Full - line Forcing

Perhaps the most obvious solution to the manufacturer's problem is to require each retailer to carry his full line of products. The upstream firm continues to charge both a wholesale price and a fixed fee for each of his products, except now the retailer does not have the option of selling only one of the brands. This contractual restraint is termed full -line forcing.

When full line forcing is specified, the retailer's choice will be given by $\max\{\Pi^{12}, 2s\}$. It is trivial to show that the manufacturer can then achieve his first best with wholesale prices equal to production marginal cost and fixed fees set such that $\Pi^{12} = 2s$.

In practice, line forcing is observed in industries such as pharmaceuticals, cosmetics, toiletries, and perfume.⁴ The explanation here applies to the extent that the goods in a manufacturer's product line are substitutes. Because the upstream firm need only determine whether the downstream firm is selling both brands, the monitoring costs of this strategy appear to be relatively low. On the other hand there are two drawbacks. First when retailers differ in their opportunity cost of shelf space, the manufacturer may wish to allow some retailers to stock a subset of his products. This is considered formally in the next section. Second, full line forcing is a form of tying, and in the U.S., may be found to be a violation of section 3 of the Clayton Act.

However, the latter problem can be circumvented since the manufacturer can obtain his first best profit without expressly specifying full line forcing. For example, by setting an appropriate single fixed fee and letting the retailer buy as much as she wants of either good,

⁴See the Monopolies and Mergers Commission (1981a).

the manufacturer can achieve full line forcing defacto.

$$w_i = w'_i = c_i, F_1 = F_2 = F_{12} \text{ s.t. } \Pi^{12} = 2s$$

This supply contract induces the retailer to sell both brands providing $\Pi^{12} \geq \Pi^i + s, i = 1, 2$. Comparing Π^{12} with $\Pi^i + s$, it is seen that the retailer's decision is exactly the condition under which a vertically integrated firm would stock the second brand, i.e. when brand j 's incremental profit contribution exceeds the retailer's opportunity cost of shelf space. By structuring the retailer's incentives in this manner, downstream strategic rent is eliminated.

In their report on full line forcing, the Monopolies and Mergers Commission recognized that full-line forcing could be achieved without formal specification in a contract. They noted that incentives could be structured "... in such a way that the level of price or discount acceptable to a customer can be obtained only when more than one of the supplier's products is bought. When this is done there is in effect a tie even though the customer is not expressly required to take more than one product."⁵ However, it was also recognized that in practice, such pricing arrangements could be difficult to detect. If so, the antitrust concerns of the firm are alleviated. But, as before, the single fixed fee may not give the desired flexibility when retailers are heterogeneous.

Maximum Resale Price Maintenance

A second solution to the manufacturer's problem is to eliminate the retailer's per-unit profit margin on each brand by setting a retail price ceiling which is equal to the transfer wholesale price.⁶ This type of contract is known as maximum resale price maintenance. Since the foregone profit from reduced sales of 1 and 2 is now zero, the retailer's opportunity cost of stocking a brand is simply her shelf space rent s . The manufacturer can pay her directly for this space with a negative fixed fee, also known as a slotting allowance. Thus the manufacturer's supply contract is given by

$$w_i = \bar{P}_i(c_i), w'_i = \tilde{P}_i(c_1, c_2), F_i = -s, F_{12} = -2s.$$

By setting a price ceiling, the upstream firm solves the successive monopoly markup problem while at the same time the retailer's strategic rent is eliminated. The retailer is induced to stock both brands since her profit is constrained to equal $2s$ in every case.

In practice, this strategy has advantages and disadvantages when compared to defacto full line forcing. It may be preferable in that with maximum resale price maintenance the burden of risk in an uncertain world is borne by the manufacturer rather than the retailer. Thus a risk averse retailer may not be willing to pay a large single fixed fee for the right to sell

⁵See Monopolies and Mergers Commission (1981a) at pp 5-6.

⁶More generally the upstream firm would reduce the markup to cover just the downstream firm's marginal costs.

the monopolist's brands. On the other hand, the retailer is assured of $2s$ if the manufacturer chooses to impose a price ceiling.

The disadvantages of price maintenance pertain to monitoring costs and an uncertain legal environment. When there is demand uncertainty, the manufacturer may not be able to distinguish between low sales due to low demand, and low sales due to retailers pricing above the ceiling. In addition the legality of the practice varies. In the U.K., the Resale Prices Act of 1976 prohibits only fixed and minimum resale prices. However, in the U.S., the law does not differentiate between the various forms of price maintenance. All are per se illegal.⁷

Brand Discounts

A third option for the manufacturer is to specify payment depending on the number of brands stocked. Such a contract would look like

$$w_i = w'_i = c_i, F_i \text{ s.t. } \Pi^i = s, F_{12} \text{ s.t. } \Pi^{12} = 2s$$

The manufacturer maximizes channel profit by choosing his wholesale prices equal to production marginal cost and extracts the retailer's excess surplus with his fixed fee/s. If the retailer stocks brand i , she is required to pay a fee of F_i . If the retailer stocks brands i and j , she is obligated to pay a fee of F_{12} . Here $F_{12} < F_1 + F_2$. Hence by carrying both brands the retailer receives a brand discount.⁸ This reduces her profit to the scarcity rent of her shelf space. She will earn $2s$ for her slots regardless of the number of brands she carries.

This strategy differs from brand specific two - part tariffs in that the manufacturer offers a discount to retailers who sell both brands. An example may be found in promotional allowances given by cigarette manufacturers to vending machine owners. There individual cigarette makers offer allowances to vending machine owners which are contingent on the number of their brands stocked.⁹

In practice, implementation of this scheme may take other forms. For example, when the non-linear price schedule is a declining multi-block tariff, or a list price discount, either all units or incremental, offering additional incentives to a retailer who purchases both brands is problematic. The manufacturer must be careful that the retailer doesn't qualify for an advantageous discount simply by selling a single unit of the second brand. Instead the manufacturer can sometimes achieve his first best profit with a volume discount or aggregate rebate.

⁷The legal status of maximum resale price maintenance may soon be changed. The current legislation before the Senate which proposes to codify the per se illegality of resale price maintenance, has recently been amended to exempt price ceilings.

⁸This term was suggested to me by Eitan Gerstner.

⁹See Schoenkopf d.b.a. "Vend Mark v. Brown & Williamson Tobacco Corp. (DC Pa. 1980), 1980-1 Trade Cases at p. 63241. See also 483 F. Supp. 1185.

Aggregate Rebates

Volume discounts, sometimes known as car-load pricing, are discounts offered to a buyer if a purchase order of sufficient size is placed. Typically sales of any item sold by the manufacturer can be applied to a buyer's overall purchase volume. Sometimes the purchase amounts of a buyer can be accumulated over a period of time. A retailer who exceeds the required threshold then qualifies for an aggregate rebate, also known as a cumulative volume discount. Since the model abstracts from time, I do not consider the distinction between these types.

Aggregate rebates can enable the manufacturer to capture additional surplus from his retailers. Intuitively, incentives can be structured so that only by carrying the manufacturer's full line will the retailer qualify for the rebate. In some cases the downstream firm's strategic rent will be eliminated. For example, the manufacturer can offer a rebate R if the sum of the downstream firm's purchase orders total at least

$$c_1 \left(D^1(\tilde{P}_1(c_1, c_2), \tilde{P}_2(c_1, c_2)) \right) + c_2 \left(D^2(\tilde{P}_1(c_1, c_2), \tilde{P}_2(c_1, c_2)) \right).$$

The idea is that if the retailer sells both brands, she will qualify for the rebate. R can be chosen such that a retailer who sells both brands earns $\Pi^{12} = 2s$. The pricing schedule can then be chosen so that a retailer who only stocks one brand and who does not qualify for the rebate will earn no more than $\Pi^i = s$.

This strategy may or not be sufficient to extract the retailer's surplus. One would still have to check that a retailer who only sells brand i does indeed maximize profits by placing an order of size $c_i \left(D^i(\bar{P}_i, \infty) \right)$. In other words it must not be the case that the retailer will want to increase her purchase of i in order to qualify for the rebate.

Volume discounts and aggregate rebates appear to be quite common.¹⁰ One advantage of this strategy over defacto full line forcing, is that the manufacturer retains the flexibility to sell a subset of his products to downstream firms. For example, this may be desirable when retailers differ in their opportunity cost of shelf space. On the other hand, implementing volume discounts and rebates may be costly in that the upstream firm is required to monitor and record individual retailer purchases over time.

Proposition 2 *Full - line forcing, maximum resale price maintenance, and brand discounts are alternative strategies which the manufacturer can use to achieve his first best outcome. Volume discounts and aggregate rebates may sometimes proxy for brand discounts.*

¹⁰See the Monopolies and Mergers Commission (1981b).

V Differing Costs of Shelf Space

This section extends the basic model by allowing for differing opportunity costs of shelf space. I will continue to assume that retailers are local monopolists, but that they are one of two possible types. Let α be the fraction of firms with a low opportunity cost of shelf space. Then $(1 - \alpha)$ is the fraction of firms with a high opportunity cost of shelf space. Denote the value of i 's shelf space as s_i , $s_h > s_l$. I will also assume that the upstream firm cannot distinguish between types apriori, but does know α . All other details of the model remain the same. Additional notation will be introduced as needed.

Solving the model is straightforward but tedious. There are nine possible subcases to consider, depending on whether the low and high cost retailer stocks zero, one, or both brands. Clearly a type i downstream firm's decision is given by

$$\max \left\{ \Pi^{12}, \Pi^1 + s_i, \Pi^2 + s_i, 2s_i \right\}.$$

When the manufacturer sets his wholesale prices equal to production marginal cost, total channel profit in each market can be denoted by $V^{12} = \Pi^{12} + F_{12}$ if both brands are carried, and $V^i = \Pi^i + F_i$ if good i is stocked alone.

Rather than proceed to a discussion of all nine cases, I will exclude the uninteresting cases by imposing the restriction that $V^{12} - V^i > s_h$. This means that the incremental channel profit obtained by adding a second brand is assumed to exceed the opportunity cost of shelf space for both types of retailers. In other words, if the manufacturer were vertically integrated, he would always stock both brands. With this assumption, it is trivial to show that the non-integrated manufacturer will follow one of three strategies. He can sell both of his products to both retailers; he can sell both of his products to the low cost retailer only; or he can sell both of his products to the low cost retailer, and one product to the high cost retailer. All other cases can be shown to be strictly dominated.

The method of solution will be to consider first the maximum possible profit that the manufacturer can earn in each of the three cases. In general this will not yield the first best profit for the manufacturer because of the self selection constraints. That is the low cost retailer can always mimic the high cost retailer. Thus, if there is a situation in which the high cost retailer is just earning her opportunity cost s_h , the low cost retailer will always be able to mimic the high cost retailer's strategy and earn $s_h - s_l$.

The maximized profit from each case will then be compared to determine a global maximum. Of course, this will depend on the value of the parameters. Finally, I will discuss how the manufacturer can implement the solution.

Case 1: Both products are carried by both types of retailers.

If the high cost retailer is to stock both products, it must be the case that $\Pi^{12} \geq 2s_h$ and $\Pi^{12} \geq \Pi^i + s_h$. Unfortunately for the upstream firm, this implies that the low cost retailer

can always earn excess surplus of at least $2(s_h - s_l)$ by selling both products. Thus it is easy to show that the most the manufacturer can earn is $V^{12} - 2s_h$.

Case 2: Both products are carried at the low cost retailer only.

For the low cost retailer to stock both products, it must be the case that $\Pi^{12} \geq \{\Pi^i + s_l, 2s_l\}$. If the high cost retailer decides not to stock the upstream firm's products, it must be the case that the scarcity rent on her two slots exceeds the profit she would earn by stocking one or both brands. Thus $2s_h \geq \{\Pi^{12}, \Pi^i + s_h\}$. Therefore one can show that the most the manufacturer can earn by selling to the low cost outlet only is $\alpha(V^{12} - 2s_l)$.

Case 3: Both products are carried at the low cost retailer, while the high cost retailer sells only one brand. Without loss of generality, let good 1 be that brand.

The inequalities corresponding to the stocking decisions for the low and high cost retailers respectively are given by $\Pi^{12} \geq \{\Pi^1 + s_l, \Pi^2 + s_l, 2s_l\}$ and $\Pi^1 + s_h \geq \{\Pi^{12}, \Pi^2 + s_h, 2s_h\}$. Since the low cost firm can always mimic the high cost firm by stocking only one brand, her excess surplus must be at least $s_h - s_l$. Therefore the best the manufacturer can do is to extract fully the surplus of the high cost type while minimizing the excess surplus of the low cost type. Thus his maximized profit in this case is $\alpha(V^{12} - s_h - s_l) + (1 - \alpha)(V^1 - s_h)$.

Comparing the manufacturer's profit in each of these cases, it is easily seen that the optimal strategy will depend on the value of the parameter α . For low α , the manufacturer will desire to sell both products to both types of retailers. For high α , the manufacturer will desire to sell only to the low cost retailers. He effectively ignores the high cost type, as the foregone profit to him of selling to them is too high. For intermediate ranges of α , the manufacturer will choose his supply contract such that both products are stocked at the low cost retailer, while the high cost firm carries only brand 1. Algebraic calculations show

Case 1 is preferred when

$$\alpha < \frac{V^{12} - V^i - s_h}{V^{12} - V^i - s_l}.$$

Case 3 is preferred when

$$\frac{V^{12} - V^i - s_h}{V^{12} - V^i - s_l} < \alpha < \frac{V^i - s_h}{V^i - s_l}.$$

Case 2 is preferred when

$$\alpha > \frac{V^i - s_h}{V^i - s_l}.$$

These findings are illustrated in figure 1. The parameters were set at $V^{12} = 10$, $V^1 = 6$, $s_h = 3$, and $s_l = 2$. As α varies from 0 to .5, the manufacturer maximizes profit in case 1. For $.5 \leq \alpha \leq .75$, profit is maximized in case 3. For $\alpha > .75$, the manufacturer prefers to sell only to the low cost retailer.

Insert figure 1 here

The manufacturer's decision will also depend on the other parameters. For example, for a given α , the manufacturer is more likely to prefer selling both products to both retailers as s_l goes to s_h . As the gap between s_l and s_h widens, the manufacturer will choose either case 2 or 3 depending on α . For illustration, see figures 2 and 3. In figure 2, α is fixed at .5. As s_l varies from 0 to 2, the manufacturer prefers case 3. For $s_l > 2$, the manufacturer will sell both products to both retailers. In figure 3, α is fixed at .8. Here case 2 is preferred as α varies from 0 to 2.25. For $2.25 \leq \alpha \leq 2.75$, case 3 maximizes profit, while for $\alpha > 2.75$, the manufacturer sells both products to both retailers.

Insert figure 2 here

Insert figure 3 here

Implementation of cases 1 and 2 proceed along the lines developed in the previous section. The manufacturer can choose supply contracts with full line forcing, defacto full line forcing, maximum resale price maintenance, brand discounts or even aggregate rebates. The choice of supply contract to implement case 3 is more restricted. Clearly full line forcing is unacceptable since case 3 calls for the high cost retailer to stock only brand 1. Maximum resale price maintenance alone is also insufficient unless the manufacturer makes the slotting allowance payments contingent on the number of products stocked. But this is precisely the role of brand discounts which I have argued may be implemented in practice with aggregate rebates.

Proposition 3 *Brand discounts pareto dominate full line forcing and maximum resale price maintenance as a means of rent extraction when the opportunity cost of shelf space varies among retailers and when the manufacturer cannot observe the retailer types.*

VI Conclusion

This paper has developed a common motive to explain why a multi-product manufacturer may resort to full - line forcing, brand discounts, aggregate rebates, or maximum resale price maintenance as part of his marketing strategy. Such practices shift surplus to the upstream firm and enable it to achieve its first best profit when retailers' opportunity costs of shelf space are known.

Somewhat surprisingly, brand specific two - part tariff contracts were found to be insufficient to maximize a manufacturer's profit. The intuition one has from the single product case breaks down when a firm produces multiple products. Since a retailer can selectively choose which brands to stock, and since the opportunity cost of stocking an additional brand includes the foregone profit from the reduced sales of substitute brands, the downstream firm will be able to earn strategic rent. Therefore brand specific two-part tariffs will not extract

the entire surplus generated by the upstream firm's products. This provided the impetus for the additional supply contracts considered in section iv.

In an effort to distinguish between the practices, I then considered the case where retailers differed in their opportunity cost of shelf space. Depending on the fraction of high to low cost retailers, and on the absolute cost advantage, it was found that the manufacturer may want to sell both of his products to both types of retailers, both of his products to the low cost retailer only, or both of his products to the low cost retailer and one product to the high cost retailer. Of the identified marketing strategies, only brand discounts and aggregate rebates were sufficient to maximize upstream profit in this latter scenario. Intuitively, these supply contracts do better because they amount to offering self selecting two - part tariffs which effectively segment the high and low cost retailers.

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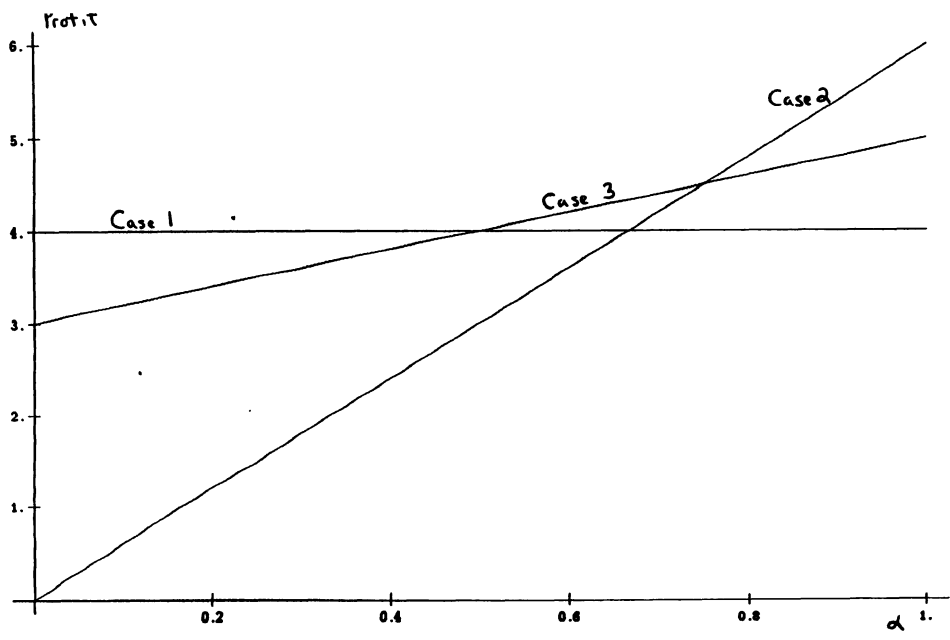


Figure 1

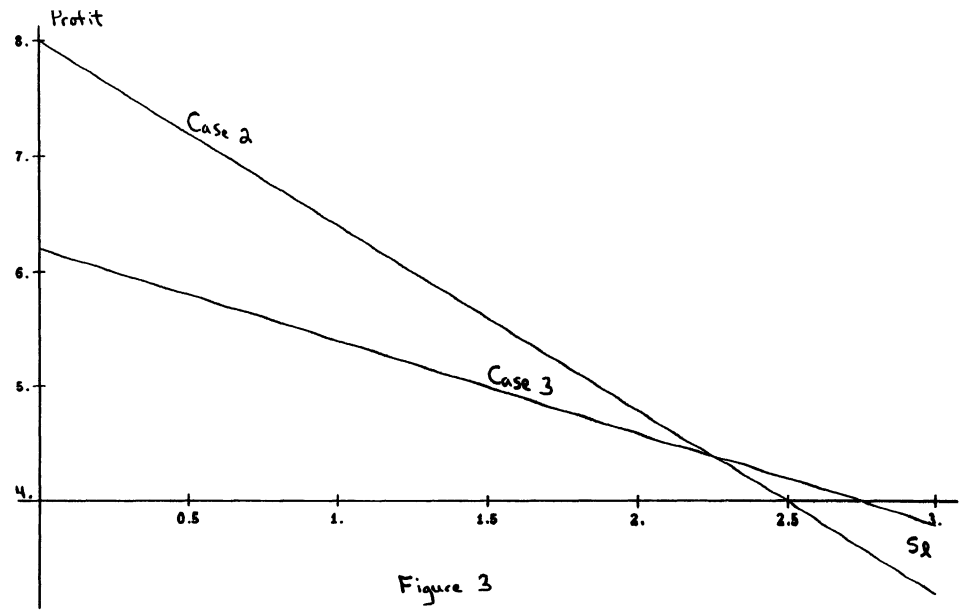


Figure 3
 $\alpha = .8$

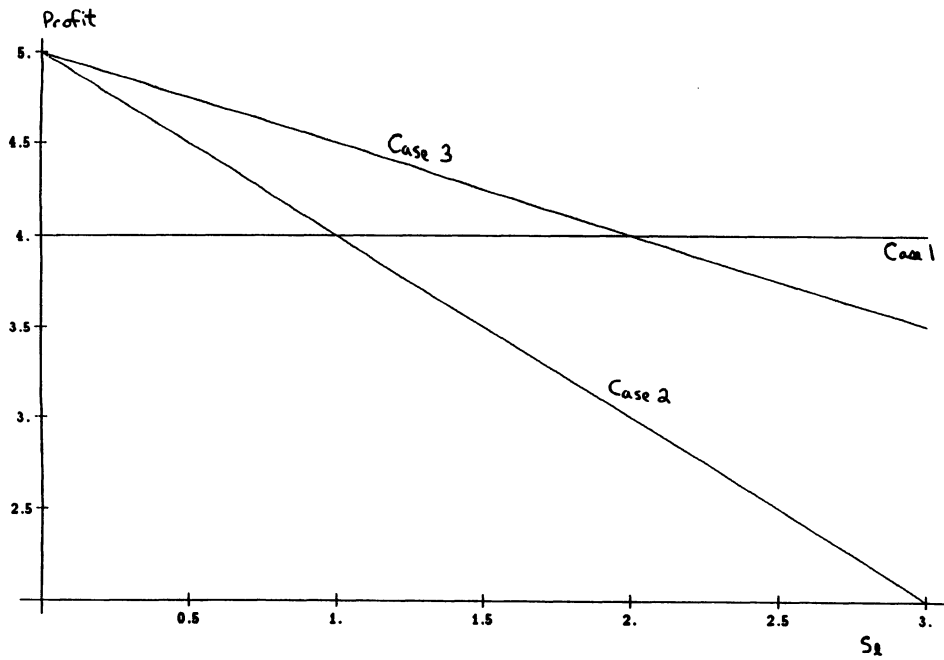


Figure 2
 $\alpha = .5$

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