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Naked Slotting Fees for Vertical Control of Multi-Product Retail Markets

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Abstract

Slotting fees -- fixed charges paid by food manufacturers to retailers for access to the retail market -- are both increasingly common and increasingly controversial. This note shows how imperfectly competitive retailers and a monopolistic supplier of one good can use "naked" slotting fees -- charges imposed on competitive suppliers of *other* goods -- to achieve a vertically integrated multi-good monopoly.

Naked Slotting Fees for Vertical Control of Multi-Product Retail Markets

I. Introduction

Slotting fees -- fixed charges paid by food manufacturers to retailers for access to the retail market -- are both increasingly common and increasingly controversial. Fixed fees are charged both for stocking of new products (Rao and Mahi, 2003) and for continued stocking of "old" products (Hamilton, 2003). Criticism of slotting charges is particularly virulent among small food producers, who claim that the fees are a flagrant form of rent extraction by large retailers (Prevor, 2000).

The academic literature offers a number of theories for why and when slotting fees might be charged, and their economic effects. On one side of this literature are theories focused principally on the charges for new product "slots." A number of scholars (e.g., Chu, 1992; Richards and Patterson, 2001; Lariviere and Padmanabham, 1997; Desiraju, 2001) argue that slotting fees can serve as a signaling or screening mechanism whereby new product producers -- better informed about the likelihood of their products' success -- can signal their likelihood of success by paying an upfront bond, or slotting fee. In addition, slotting charges may raise manufacturers' incentives for post-product-launch promotion (Chu, 1992). Others (most notably Sullivan, 1997) argue that slotting fees serve to price costly shelf-space in a competitive market, thereby efficiently equating the demand and supply for product diversity.

A competing literature -- to which the present note contributes -- focuses on the strategic use of slotting fees in imperfectly competitive marketing chains, theories that apply generically to any product, new or old. Shaffer (1991a) studies the use of slotting fees by duopolistic retailers who compete in prices and face competitive suppliers. He finds that a two-part tariff -- a slotting fee combined with an elevated wholesale price -- serves to precommit a retailer to a higher retail price, thus reducing the extent of retail competition, to the retailers' advantage and society's loss. Hamilton (2003) turns the story around by considering duopolistic manufacturers who face an up-sloping raw product supply and a competitive retail sector. Here, a two-part retailer-manufacturer contract stipulates a slotting fee, a wholesale price, and a retailer

commitment to accept all supply forthcoming from the manufacturer at the contracted wholesale price. A slotting fee contract is advantageous to each manufacturer because it implicitly precommits him to more aggressive quantity competition in the upstream market for raw product supply; thus, in contrast to Shaffer (1991a), slotting fees are pro-competitive.

While these strategic effects are derived in markets for a single product, we focus instead on the role of slotting fees when there are multiple products in the marketing chain. In particular, we consider a monopoly supplier of one product and a competitive industry that supplies a second product, with both products marketed through duopolistic retailers. In this context, we study how "naked" slotting fees -- fees imposed on the competitive fringe by agreement between the monopoly manufacturer and retailers -- can be used to control pricing of the competitive fringe product to the advantage of the contracting parties. After first showing that both retail competition and the presence of a second ("fringe") product are necessary for the emergence of the positive slotting fees observed in practice, we turn to how different types of contracts -- some constrained to charge the monopoly supplier a symmetric slotting fee, and others not so constrained -- can be used to achieve the monopoly-cum-retailer optimum. Notably, these results are consonant with the observed consternation of "small" suppliers over the imposition of slotting fees by retailers, as opposed to their mutual agreement in contracts (as in Shaffer, 1991a, and Hamilton, 2003). However, although manufacturer market power is at the heart of our analysis (as in Hamilton, 2003), we find that slotting fees are strikingly anti-competitive (in contrast to Hamilton, 2003).

This work is closely related to the vertical control literature. For example, Winter (1993) considers a similar model with a single (monopoly) product, no competitive "fringe," duopoly retailers, and an added retailer choice of "service." While he focuses on how vertical contracts can be used to correct excessive retail price competition, and under-provision of service, we are interested instead in how contracts -- and slotting fees in particular -- can be used

to control pricing of additional products.¹ There is also a substantial (and closely related) literature on extension of monopoly to other products using tying arrangements in vertical contracts (e.g., Whinston, 1990; Carbajo, et al., 1990; Shaffer, 1991b). This literature focuses on multi-product producers seeking to extend the advantage enjoyed by their monopolistically supplied good to other of their products.² In contrast, the distinct focus here is on how *slotting fee contracts* can be used to capture monopoly rents from markets for *other firms'* products in the marketing chain.

The remainder of the paper is organized as follows. Section II presents the model and discusses the centrality of multi-product marketing and retail competition to the emergence of slotting fees. Section III characterizes baseline outcomes: the choices of a vertically integrated marketing chain (the first-best) and outcomes absent contracts; here, it is shown that simple wholesale pricing cannot achieve the first-best. Section IV characterizes first-best slotting fee contracts. Section V concludes.

II. The Model

Consider a two-good market in which a monopolist produces one good (product 1) and a competitive industry (fringe) produces the other good (product 2). Monopoly and competitive fringe production are both at constant marginal cost, c^1 and c^2 respectively. Both products must be sold through duopolistic retailers who compete for customers by choice of product prices.

Consumers (the number of whom is normalized to equal one) have preferences over retailers and products. More specifically, consumers shop at one retail outlet and choose which outlet based upon a preference parameter θ to be discussed in a moment. Given a retail choice, $j \in \{1, 2\}$, and consumption bundle, (y^1, y^2) , a consumer obtains the utility:

$$(1) \quad u(y^1, y^2) = \sum_{i=1}^2 p_1^j y^i,$$

¹Adding service, or shelf-space choices, to the present paper's model yields some further insights into the adverse effects of slotting fees (see Section V below for further discussion); however, it does not alter qualitative results.

²Shaffer (1991b), for example, studies how a contract between a multi-product monopolist and a single retailer can be used by the monopolist to ensure that the retailer stocks the monopolist's full line of products.

where

$$y^i = \text{quantity of good } i \text{ purchased,}$$

$$p_j^i = \text{price of good } i \text{ at retailer } j,$$

We assume that u is increasing and concave with bounded first derivatives; $u_{12}=0$ (the goods are weak substitutes in consumption);³ and $\frac{\partial \ln u_i}{\partial \ln y^i} = \frac{\partial \ln u_i}{\partial \ln y^j}$ for $j \neq i$ (own good effects dominate). Choosing consumption optimally, a consumer at retailer j obtains the indirect utility,

$$(2) \quad u_j^* = u^*(p_j^1, p_j^2) = \max_{\{y^1, y^2\}} u(y^1, y^2) - \sum_{i=1}^2 p_j^i y^i.$$

A consumer's retail choice is based upon the preference parameter θ , which represents the consumer's net preference for retailer 2, and is distributed uniformly (in the population of consumers) on the support $[-\bar{\theta}, \bar{\theta}]$. Formally, a θ -consumer obtains the utility u_1^* if shopping at retailer 1 and $u_2^* + \theta$ if shopping at retailer 2. Given retail prices, consumers are thus partitioned according to:

$$\theta = \theta^*(u_1^*, u_2^*) \quad \text{purchase from retailer 1,}$$

$$\theta > \theta^*(u_1^*, u_2^*) \quad \text{purchase from retailer 2,}$$

where $\theta^*(u_1^*, u_2^*) = u_1^* - u_2^*$.

Absent contracts, the monopolist sets a wholesale price w^1 and the competitive fringe prices at cost, $w^2=c^2$. In what follows, we will be interested in how equilibrium outcomes without contracts depart from the optimum for the integrated marketing chain (the "first best"). We will then characterize "slotting fee" contracts that can improve the lot of both the monopolist and the retailers by achieving their integrated (first-best) outcomes.

Before studying this model, however, it is instructive to briefly consider alternative frameworks either (a) without retail competition, or (b) with a single product. If the monopoly wholesaler were faced with a monopoly retailer -- or a retailer subject to an exogenous

³We denote partial derivatives of u with subscripts, so that (for example), $u_{12} = \frac{\partial^2 u}{\partial y^1 \partial y^2}$.

consumer "reservation utility" constraint -- an optimal two-part contract between the two firms would be simple: (1) a marginal cost wholesale price ($w^1=c^1$) under which the retailer maximizes the integrated profit of the marketing chain, and (2) a negative "slotting fee" whereby the retailer pays the monopoly wholesaler for his share of profit.

Alternately, suppose that we have retail competition, but only over the single (monopolist wholesaler) product. Then, defining p^* as the integrated monopoly retail price, the following is easily shown:⁴

Observation 1. If retailers compete only over the single (monopoly wholesaler) product, (a) there is a wholesale price, $w^* \sum(c^1, p^*)$, such that retailers set their retail price optimally, $p^1=p^*$; and (b) in a bargaining equilibrium that splits joint gains from contracting (more on this below), an optimal two-part contract will set $w^1=w^*$ and rebate lost monopoly profits (and the monopolist's share of contracting gains) with a negative slotting fee.

The intuition for these results is straightforward: With marginal cost wholesale pricing ($w^1=c^1$), each retailer under-prices in order to attract customers from her rival; hence, an above-cost wholesale price, $w^1=w^*$, is needed to elicit optimal retail pricing. However, absent contracts, the monopolist will (in general) set a different wholesale price in order to maximize his wholesale (rather than integrated chain) profit. Hence, an optimal contract elicits a first-best by stipulating a *different* wholesale price than maximizes the monopolist's profit, requiring that the monopolist be compensated with a negative slotting fee.

In sum, we see that *retail competition in multiple products* is necessary to provide an interesting motive for the *positive* slotting fees observed in practice.

III. First-Best and No Contract Outcomes

In this model, a vertically integrated monopoly solves the following problem:

$$(3) \quad \max_{\{p^1, p^2\}} \sum_{i=1}^2 (p^i - c^i) y^i(p^1, p^2) + \Pi(p^1, p^2) \quad \{p^1, p^2\},$$

⁴Proofs of Observation 1 and Propositions 2-4 below are contained in the Appendix.

where $y^i() + \text{argmax} \{u(y^1, y^2) - \sum_{i=1}^2 p^i y^i\}$. The solution to this problem yields the maximum profit available in this market, $\Pi^* + \Pi(p^1, p^2)$, and will be called the first-best.

We will first establish that simple wholesale pricing -- and no contracts -- cannot give rise to a first-best, thus motivating supplier-retailer contracts.⁵ In doing so, we will describe the retailer pricing incentives that are central to the design of contracts. Specifically, consider the choice problem of retailer 1 (R1):⁶

$$(4) \quad \max_{\{p^1, p^2\}} \pi_1(p^1, p^2; \bar{u}_2, w^1, w^2) + \sum_{i=1}^2 (p^i - w^i) y^i(p^1, p^2) \phi(p^1, p^2; \bar{u}_2) \\ = \Pi(p^1, p^2) \phi(p^1, p^2; \bar{u}_2) - \sum_{i=1}^2 (w^i - c^i) y^i(p^1, p^2) \phi(p^1, p^2; \bar{u}_2)$$

where $w^2 = c^2$ and

$$\phi(p^1, p^2; \bar{u}_2) = \text{market share of R1, given R2's price selection (and attendant consumer utility } \bar{u}_2) \\ = \{\bar{\theta} + u^*(p^1, p^2) - \bar{u}_2\} / [2\bar{\theta}].$$

First order necessary conditions for a solution to this problem are:

$$(5) \quad \partial \pi_1 / \partial p^1 = (\partial \Pi / \partial p^1) \phi + \Pi() (\partial \phi / \partial p^1) - \sum_{i=1}^2 (w^i - c^i) [(\partial y^i / \partial p^1) \phi + y^i (\partial \phi / \partial p^1)] = 0 \\ (6) \quad \partial \pi_1 / \partial p^2 = (\partial \Pi / \partial p^2) \phi + \Pi() (\partial \phi / \partial p^2) - \sum_{i=1}^2 (w^i - c^i) [(\partial y^i / \partial p^2) \phi + y^i (\partial \phi / \partial p^2)] = 0$$

where

$$(7) \quad \partial \phi / \partial p^i = (2\bar{\theta})^{-1} (\partial u^* / \partial p^i) = - (2\bar{\theta})^{-1} y^i(p^1, p^2) < 0.$$

Loosely speaking, there are two reasons why the retailer's pricing incentives depart from those of the vertically integrated chain. First, higher retail prices (ceteris paribus) prompt marginal consumers to switch to the other retailer; this loss of custom is costly to the retailer, but of no concern to the vertically integrated chain. (The second terms in eq.s (5)-(6) capture

⁵Even if wholesale pricing could achieve a first-best, contracts would be motivated by a divergence between the monopoly (product 1) supplier's pricing incentives and those of the integrated marketing chain.

⁶Choices of retailer 2 are symmetric and thus omitted.

these effects.) Second, because the retailer pays an above-cost wholesale price to the monopoly supplier ($w^1 > c^1$) -- whereas the vertically integrated chain faces true cost c^1 -- retail price effects on good 1 demand have a smaller impact on retailer profit than on vertically integrated profit.

(The third set of terms in eq.s (5)-(6) captures these effects.)

Following Winter's (1993) logic, the good 1 wholesale price could be set so that these two effects exactly offset one another *for the good 1 retail price*; that is, if w^1 is chosen so that the last terms in eq. (5) vanish, then R1 will set p^1 optimally:

$$(8) \quad w^1 - c^1 = \Pi(\cdot) \frac{(\partial \phi / \partial p^1)}{[(\partial y^1 / \partial p^1) \phi + y^1 (\partial \phi / \partial p^1)]} > 0.$$

However, with w^1 set per eq. (8), the last terms in eq. (6) do not vanish when p^2 is set equal to its integrated optimum, p^{2*} :

$$(9) \quad \frac{\partial \pi_1(p^1, p^2; \bar{u}_2, w^1, c^2)}{\partial p^2} \Big|_{\text{eq. (8)}} \\ = \Pi^* [(\partial y^1 / \partial p^1) \phi + y^1 (\partial \phi / \partial p^1)]^{-1} \phi \{ (\partial \phi / \partial p^2) (\partial y^1 / \partial p^1) - (\partial \phi / \partial p^1) (\partial y^1 / \partial p^2) \} < 0,$$

where the inequality is due to $\partial y^1 / \partial p^1 < 0$, $\partial \phi / \partial p^i < 0$ ($i=1,2$), $\Pi^* > 0$, $\phi > 0$, and $\partial y^1 / \partial p^2 = 0$ (with $u_{12} = 0$). Thus, the retailer prefers a lower good 2 price in order to attract custom from the competition and because the retailer's cost of the lower price, in reduced demand for the substitute good 1, is lower than for the integrated chain (given $w^1 > c^1$).

Proposition 1. (A) Simple wholesale pricing cannot achieve the first-best. (B) Closed territorial division of the market, with $w^1 = c^1$, will yield the first-best.

With closed territories and marginal cost wholesale pricing, both departures of retailer incentives from those of the integrated chain, evaporate. However, because consumers determine where they go, not retailers -- and retailers cannot identify a consumer's preference location -- we assume that territorial division of the market is impossible.

IV. Contracts

Because a first-best cannot be achieved without contracts, there is potential for contracts to deliver collective gains. We will assume that contract terms are determined by bargaining, following standard approaches in the bargaining literature (see, for example, Macleod and Malcomson, 1995). Rather than dwelling on the precise form of the bargaining game, we

simply assume that the game is such that there is a unique subgame perfect equilibrium that splits collective gains from contract implementation according to a known rule (as in Rubinstein, 1982; Shaked, 1987; and others). The issue of interest here is the form that a first-best contract can take.

As is often the case, there are many possible contracts that can achieve a first-best. For example, a "naked" resale price contract that stipulates the first-best price pair (p^1, p^2) will clearly work, with rent distributed using either (1) a fixed transfer between retailers and the monopoly (good 1) supplier or (2) a suitable above-cost good-1 wholesale price, $w^1 > c^1$.

We will focus only on contracts that impose slotting fees on the competitive fringe -- fixed fees that entitle a fringe supplier to market access at the retail outlets. For example, consider a retailer compelled by contract to charge its competitive fringe suppliers a lump-sum (total) slotting fee of $f^2 > 0$. The retailer then faces fringe suppliers competing in wholesale prices (w^2) for exclusive access to his retail market at the cost f^2 ; he selects among suppliers with the lowest wholesale prices on offer. The fixed slotting fee thus confronts the retailer with a wholesale price that satisfies, in equilibrium, the competitive fringe zero-profit condition,

$$(10) \quad (w^2 - c^2)y^2(p^1, p^2) \phi() = f^2.$$

By eq. (10), "naked" slotting fees imposed on the fringe (good 2) suppliers can be used to support an above-cost wholesale price, $w^2 > c^2$. An elevated wholesale price can, in turn, be exploited to correct retailers' incentives to under-price the fringe product.

(A) Naked Asymmetric Slotting Fees: The Simplest Contract. We first consider a naked slotting fee contract with a freely chosen transfer between retailers and the monopoly (good 1) supplier. This contract consists of (1) a fringe slotting fee f^2 ; (2) a monopoly wholesale price w^1 ; and (3) a monopoly-retailer transfer f^1 . The last (f^1) transfer distributes rents according to the bargaining equilibrium. Our task is to find wholesale prices that yield a first-best, (w^1, w^2) ; given these prices, there are corresponding contract terms that support them:

$$(11) \quad w^1 = w^1 \quad \text{and} \quad f^2 = (w^2 - c^2)y^2(p^1, p^2)/2.$$

Formally, we assume that there are unique solutions to the retailers' first-order optimality conditions for relevant wholesale prices (w^1, w^2) and competitor practices (\bar{u}_1, \bar{u}_2). Given retail symmetry, we thus seek a pair (w^1, w^2) that satisfies eq.s (5)-(6) at $p^1=p^{1*}, p^2=p^{2*}$, and $\bar{u}_2=u^*(p^{1*}, p^{2*})$.⁷ Doing so yields:

Proposition 2. A naked asymmetric slotting fee contract can support the first-best, with $w^1 > c^1$ and $f^2 > 0$ (so that $w^2 > c^2$).⁸

A notable feature of this contract is the asymmetric slotting fee charged the monopoly (good 1) supplier and the fringe (good 2) suppliers. Indeed, rent transfer to the monopolist can imply a negative "fee" for the monopolist -- payment to the monopolist from the retailer -- at the same time as the fringe is charged a positive slotting fee. In some respects, this feature seems consonant with the heuristic empirical observation that larger manufacturers are less likely to pay slotting fees than are smaller ones (Freeman and Myers, 1987; Rao and Mahi, 2003; Sullivan, 1997, note 9). However, as we turn to symmetric slotting fee contracts next, we will see that this asymmetry -- and the attendant transparency of the contract's anti-competitive effect -- is not needed to achieve a first-best.

(B) Naked Symmetric Slotting Fees with Resale Price Maintenance. A symmetric slotting fee ($f=f^1=f^2$) can be used to raise the fringe good's wholesale price, but not to achieve a desired distribution of rents between retailers and the monopolist. Instead, let the monopolist's (good 1) wholesale price be used for rent distribution, with good 1 retail pricing incentives driven by a resale price maintenance contract provision. The monopoly-retailer contract thus consists of (1) a slotting fee f ;⁹ (2) a good 1 resale price stipulation, $p^1=p^{1*}$; and (3) a

⁷By symmetry, this wholesale price pair will also satisfy retailer 2's optimality conditions at $p^1=p^{1*}, p^2=p^{2*}$, and $\bar{u}_1=u^*(p^{1*}, p^{2*})$.

⁸The proof of Proposition 2, contained in the Appendix, derives the stated inequalities, $w^i > c^i$, thus establishing the optimality of a positive slotting fee, $f^2 > 0$.

⁹In a more realistic model, the slotting fee could be tied to shelf-space and, thus, be different for monopolist and fringe. However, symmetry will then restrict the slotting fee to reflect common prices of shelf-space across suppliers. An optimal (integrated chain) shelf-space allocation will thus tie the slotting fees charged the two suppliers, and prevent their use for desired rent distribution. The foregoing analysis captures this sort of restriction in the simplest possible way.

wholesale price w^1 . The object of the contract is to achieve first-best retail pricing of the fringe product (good 2) and to distribute integrated chain profits (Π^*) to retailers and the monopolist according to the bargaining equilibrium. Letting $\pi^M < \Pi^*$ denote the monopolist's bargained profit, the latter rent distribution objective requires:

$$(12) \quad (w^1 - c^1)y^1(p^1, p^2) = (w^2 - c^2)y^2(p^1, p^2) + \pi^M,$$

where the first right-hand term gives the total (two retailer) slotting fee that the monopolist must pay in order to support the fringe wholesale price w^2 . The retailer incentive constraint requires that eq. (6) be satisfied at $p^2 = p^{2*}$ (and $p^1 = p^{1*}$). Finding the wholesale price pair (w^1, w^2) that satisfies eq.s (6) and (12) at $p^1 = p^{1*}$, $p^2 = p^{2*}$, and $\bar{u}_2 = u^*(p^{1*}, p^{2*})$, yields:

Proposition 3. The first-best can be supported by a naked symmetric slotting fee contract with (1) resale price maintenance, $p^1 = p^{1*}$; (2) a positive slotting fee and fringe price markup, $f > 0$ and $w^2 > c^2$; and (3) a positive monopoly markup, $w^1 > c^1$.

(C) Naked Symmetric Slotting Fees with Quantity Contracting. Rather than directly imposing a retail price on its client retailers -- a practice of dubious legality (Winter, 1993; Shaffer, 1991a; Butz and Kleit, 2001) -- the monopolist can elicit optimal pricing using a combination of a fixed quantity commitment (for its good 1 supply) and a slotting fee.¹⁰ The former can be used to peg the good 1 retail price, while the latter controls retail pricing of the fringe (good 2) product. Profits can then be distributed (as before) by appropriate selection of the wholesale price w^1 .

Formally, let $q = y^1(p^{1*}, p^{2*})/2$ be the optimal quantity commitment, implying the constraint (for retailer 1),¹¹

$$(13) \quad y^1(p^1, p^2) \phi(p^1, p^2; \bar{u}_2) = q \quad p^1(p^2; \bar{u}_2).$$

Given wholesale prices and the quantity commitment, R1's problem becomes:

¹⁰The potential symmetry between price and quantity contracts is well-known, although not universal (e.g., Reiffen, 1999). Given the widespread use of quantity contracts (e.g., see Calvin, et al., 2001) and their arguable legal advantages, it is worthwhile to verify their ability to support first-best outcomes in the present model.

¹¹In general, the retailer will not want to waste output (by not selling the committed quantity). However, for simplicity, we assume that a fixed quantity contract commits both the seller (who agrees to supply exactly q) and the buyer (who agrees to market exactly q).

$$(14) \quad \max_{p^2} [p^1(p^2; \bar{u}_2) - w^1] q + (p^2 - w^2) y^2(p^1(p^2; \bar{u}_2), p^2) \phi(p^1(p^2; \bar{u}_2), p^2; \bar{u}_2).$$

The attendant first order condition for R1's optimum is:

$$(15) \quad (\partial p^1 / \partial p^2) [q + (p^2 - w^2) (y_1^2 \phi + y^2 \phi_1)] + [y^2 \phi + (p^2 - w^2)(y_2^2 \phi + y^2 \phi_2)] = 0,$$

where

$$(16) \quad (\partial p^1 / \partial p^2) = - (y_2^1 \phi + y^1 \phi_2) / (y_1^1 \phi + y^1 \phi_1).$$

To support a first-best, we need to find a wholesale price w^2 such that, in a symmetric equilibrium, the solution to eq. (15) (and hence, problem (14)) sets $p^2 = p^{2*}$; ¹² optimal good 2 pricing in turn implies optimal good 1 pricing, $p^1 = p^{1*}$ (by eq. (13) and the definition of q). An optimal contract sets the slotting fee so as to support this optimal wholesale price w^{2*} (per eq. (11)), and sets the monopoly wholesale price w^1 so as to provide the requisite rent distribution (per eq. (12)).

Proposition 4. The first-best can be supported by a naked symmetric slotting fee contract with (1) a fixed monopoly quantity commitment (per retailer), $q = y^1(p^{1*}, p^{2*})/2$; (2) a positive slotting fee and fringe markup, $f > 0$ and $w^2 > c^2$; and (3) a positive monopoly markup, $w^1 > c^1$.

V. Conclusion

This paper shows how imperfectly competitive retailers and a monopolistic supplier of one good can use "naked" slotting fees -- fixed charges imposed on competitive suppliers of *other* goods -- to achieve a vertically integrated multi-good monopoly. In view of these anti-competitive effects, this paper suggests that slotting fees merit careful scrutiny under the anti-trust laws; in the language of anti-trust doctrine (Cannon and Bloom, 1991), this paper suggests that slotting fees may be used to achieve predatory discrimination, even when the fees are symmetrically imposed on all suppliers using the resale price maintenance or fixed quantity contracts discussed above. This implication is at odds with Hamilton's (2003) conclusion that

¹²We assume that, for the optimal w^{2*} (as characterized below) and $\bar{u}_2 = u^*(p^{1*}, p^{2*})$, there is a unique solution to eq. (15) which (therefore) uniquely solves problem (14).

slotting fees may be pro-competitive when product supply is imperfectly competitive. A distinguishing symptom of Hamilton's (2003) analysis is that slotting fees be at the initiative of suppliers, as seems to be the case in some instances (bagged salads, for example).¹³ However, when slotting fees are paid by "small" suppliers and at the initiative of retailers -- as seems broadly and increasingly the case (Gibson, 1988; Therrien, 1989; Prevor, 2000; Rao and Mahi, 2003) -- Hamilton's (2003) logic would appear not to apply and the anti-competitive conclusions of this paper (for multi-good marketing chains with imperfectly competitive supply) or Shaffer (1991a) (for single-good vertical chains with competitive supply) may instead be relevant.

The simplified analysis developed in this paper suggests some natural generalizations. For example, retail outlets may not only make pricing decisions, but also allocate shelf-space.¹⁴ In this case, slotting fee contracts may have even more pernicious effects. Absent contracts, shelf-space allocation decisions will be pro-competitive because concentrated suppliers face an additional deterrent to elevating wholesale prices -- the prospective loss of shelf-space that will be allocated to their now-lower-retail-margin products. Slotting fee contracts can end this pro-competitive effect by pre-stipulating shelf-space and ostensibly charging for it with a slotting fee.

In the foregoing analysis, no attention was paid to the enforceability of contracts. For example, will retailers want -- and be able -- to renege on their pledge to charge slotting fees for competitive fringe products? On one hand, the logic of Shaffer (1991a) (although complicated by a multiple product domain) suggests that retailers may want to charge observable slotting fees to their competitive suppliers, even if they are not compelled to do so by contract. On the other hand, the calculus of this choice will certainly differ from that determining the monopoly-retailer contracts characterized above. There are two possible resolutions to this potential

¹³See Calvin, et al. (2001).

¹⁴Shelf-space may be a form of "service," as studied in Winter (1993). However, in the short-run at least, shelf-space is also different in that it is a fixed resource to be allocated between products, as opposed to a freely selected service for individual products or collective custom.

conflict. First, in the case of symmetric slotting fees, any departures from the contractually stipulated fee for the competitive fringe could be contractually punished by a reduction in the slotting fee paid by the monopolist. With the fixed quantity contract, for example, the monopolist could then only be made better off by a retailer's departure from the pre-stipulated slotting fee -- and the retailers made worse off.¹⁵ Second, using a combination of resale price maintenance (and/or fixed quantity), wholesale price, and fixed transfer contract terms, the retailers could potentially be provided the needed *incentive* to set an optimal slotting fee for the competitive fringe.¹⁶

Finally, we have modeled supplier imperfect competition in its starkest form -- that of a monopoly producer. If there are multiple oligopolistic constant-cost suppliers, then qualitative conclusions of the analysis extend directly provided one or more suppliers can bargain with all retailers. Nevertheless, there are at least two reasons to expect matters to change with oligopoly supply. First, suppliers and retailers may only be able to bargain unilaterally with one another. In this case, there will be a Shaffer (1991a) type contracting environment with multiple products. Second, in a differentiated product market, an incumbent firm may enjoy dominance at present, but risk losing dominance if consumers become accustomed to a new rival's product. In this case, the dominant firm has an incentive to deter entry even if total available market profit is higher with rival production.¹⁷ Slotting fees can serve such entry-deterrence purposes. However, neither of these complications fundamentally alters the logic of "naked" slotting fees designed to extract rents from competitive product markets in multi-product marketing chains.

¹⁵This does not necessarily rule out a Prisoner's Dilemma outcome in the post-contract retail game, although a sufficiently large penalty for retailer defections -- that is, a sufficiently large reduction in the monopoly's slotting payment -- would presumably avoid such an outcome.

¹⁶Characterizing how this can be done is beyond the scope of this note, but will involve an altered stage game in which (1) monopoly-retailer contracts are first signed; (2) retailer contracts with fringe suppliers are then signed; (3) retailers set retail prices; and (4) production and trade occur.

¹⁷See Bernheim and Whinston (1998) for a complete development of this point.

Appendix

Proof of Observation 1. Let $y(p)$ denote consumer demand for the single (monopolist) product. Then

$$(A1) \quad p^* = \operatorname{argmax} (p-c^1)y(p) \otimes y(p)+(p-c^1)y'(p) = 0.$$

Retailer 1's choice problem, given wholesale price w , is

$$(A2) \quad \max_p J^R(p;w) = (p-w)y(p)(\bar{\theta} + \theta^*),$$

yielding a solution $p^R(w)$ that satisfies:

$$(A3) \quad \partial J^R(p)/\partial p = (\bar{\theta} + \theta^*)(y+(p-w)y') - y^2(p-w) = 0,$$

with $\partial \theta^*/\partial p = -y$. For simplicity, we assume that the solution to (A3) -- and hence, $p^R(w)$ -- is

unique for relevant w . By symmetry, the monopolist's wholesale price choice problem is:

$$(A4) \quad \max_w J^M(w) = (w-c^1)y(p^R(w)).$$

(a) Note that, at $w=p=p^*$,

$$\partial J^R(p^*;p^*)/\partial p = (\bar{\theta} + \theta^*)(c^1-p^*)y' > 0,$$

while at $w=c^1$,

$$\partial J^R(p^*;c^1)/\partial p = -y^2(p^*-c^1) < 0.$$

By the intermediate value theorem, there is a $w^* \in (c^1, p^*)$ such that $\partial J^R(p^*;w^*)/\partial p = 0$, which (by symmetry and the uniqueness of (A3)'s solution) establishes part (a).

(b) If the solution to (A4) is $w=w^*$, then a first-best is achieved without contract and no contracts will be signed. If the solution to (A4) is $w \neq w^*$, then first-best two-part contracts stipulate $w=w^*$. In a bargaining equilibrium, the monopolist receives his base no-contract profit plus a non-negative share of joint gains from implementation of the first-best. Hence, the fixed transfer from monopolist to retailers (the slotting fee f) satisfies:

$$J^M(w^*) - 2f = \max_w J^M(w),$$

where the left-hand-side is the monopolist's payoff under contract and the right-hand-side is his no-contract payoff. Hence,

$$f = (1/2) \{ J^M(w^*) - \max_w J^M(w) \} < 0,$$

where the second inequality is due to $\arg\max J^M(w) \neq w^*$, and revealed preference. QED.

Proof of Proposition 2. After some tedious manipulations, it can be seen that the following wholesale price markups will solve eq.s (5)-(6) at $p^1=p^{1*}$ and $p^2=p^{2*}$ (where $\partial \Pi / \partial p^1 = \partial \Pi / \partial p^2 = 0$):

$$(A5) \quad (w^i - c^i) = A_i / B \quad \text{for } i=1,2,$$

where, with $y_j^i = y^i / p^j$ and $\phi_j = \phi / p^j = - (2\bar{\theta})^{-1} y^j(p^1, p^2)$ for $(i,j) \in \{1,2\}$,

$$(A6) \quad A_i = \Pi^* \phi [y_1^i \phi_j - y_j^i \phi_i] = 0, \quad j \neq i$$

$$(A7) \quad B = (y_1^1 \phi + y_1^2 \phi_1) (y_2^2 \phi + y_2^1 \phi_2) - (y_2^1 \phi + y_1^2 \phi_2) (y_1^2 \phi + y_2^1 \phi_1) \\ = \phi \phi [y_1^1 y_2^2 - y_1^2 y_2^1] + \phi [y_1^1 y_2^2 \phi_2 + y_2^2 y_1^1 \phi_1 - y_1^2 y_2^1 \phi_2 - y_2^1 y_2^1 \phi_1] = 0.$$

The inequalities in (A6)-(A7) are due to $y_i^i < 0$ (for $i=1,2$); $\phi_i < 0$ (for $i=1,2$); with $u_{12} = u_{21} = 0$ (by assumption), $y_j^i \stackrel{S}{=} -u_{ij} = 0$ (for $j \neq i, (i,j) \in \{1,2\}$); and, by concavity of u , $y_1^1 y_2^2 - y_1^2 y_2^1 > 0$.

Provided $\phi > 0$, the inequalities in (A6)-(A7) are strict; hence, evaluating A_1, A_2 , and B at $\phi=1/2$, $p^1=p^{1*}$, and $p^2=p^{2*}$ yields eq. (A5) wholesale prices, $w^{1*} > c^1$ and $w^{2*} > c^2$, that implement the first-best. QED.

Proof of Proposition 3. Solving eq.s (12) and (6) jointly for $(w^2 - c^2)$, with $p^1=p^{1*}$ and $p^2=p^{2*}$, yields

$$(A8) \quad (w^2 - c^2) = C/D,$$

where

$$(A9) \quad C = (\Pi^* - \pi^M) y_1^1 \phi_2 - \pi^M y_2^1 \phi < 0$$

$$(A10) \quad D = y_2^2 (y_2^1 \phi + y_1^2 \phi_2) + y_1^1 (y_2^2 \phi + y_2^1 \phi_2) \\ = \phi u_1 [(d \ln u_1 / d \ln y^1) - (d \ln u_1 / d \ln y^2)] + 2y_1^1 y_2^2 \phi_2 < 0.$$

The inequalities in (A9)-(A10) follow from $0 < \pi^M < \Pi^*$, $y_2^1 = 0$, $d \ln u_1 / d \ln y^1 < 0$, and (by assumption) $d \ln u_1 / d \ln y^1 > d \ln u_1 / d \ln y^2$. Evaluating C and D at $\phi=1/2$, $p^1=p^{1*}$ and $p^2=p^{2*}$ yields eq. (12) and eq. (A8) wholesale prices that implement the first-best, with $w^2 > c^2$ by (A8)-(A10), and $w^1 > c^1$ by eq. (12), $w^2 > c^2$, and $\pi^M > 0$. QED.

Proof of Proposition 4. We need to find a $w^2 = w^{2*} > c^2$ that satisfies eq. (15) at $p^2 = p^{2*}$ (and hence, $p^1 = p^{1*}$), $\bar{u}_2 = u^*(p^{1*}, p^{2*})$, and $\phi = 1/2$ (by symmetry of the equilibrium).

Evaluating eq. (15) at the latter values by substituting eq. (16) and (from the definitions of p^{1*} , p^{2*} , and $q=y^1\phi$),

$$y^2 + (p^2-w^2) y_2^2 = - \{ (w^2-c^2)y_2^2 + (p^1-c^1)y_2^1 \}$$

$$q + (p^2-w^2)y_1^2 \phi = - \phi \{ (w^2-c^2)y_1^2 + (p^1-c^1)y_1^1 \}$$

we can collect terms to yield

$$(15') \quad (y_1^1 \phi + y^1 \phi_1)^{-1} \{ (w^2-c^2) E + F \} = 0,$$

where

$$(A11) \quad E = (y_1^2 \phi + y^2 \phi_1) (y_2^1 \phi + y^1 \phi_2) - (y_2^2 \phi + y^2 \phi_2) (y_1^1 \phi + y^1 \phi_1)$$

$$= - B < 0,$$

$$(A12) \quad F = \phi \Pi^* [y_1^1 \phi_2 - y_2^1 \phi_1] > 0,$$

where B is defined in eq. (A7) and the inequalities follow from $\phi=1/2>0$, eq. (A7), $\Pi^*>0$, $y_i^i < 0$, $y_j^i = 0$ ($j \neq i$), and $\phi_i < 0$. From (15') and (A11)-(A12), w^{2*} satisfies: $(w^2-c^2)=-F/E>0$.

QED.

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