



Working Paper Series

FSWP2004-02

NAKED SLOTTING FEES FOR VERTICAL CONTROL OF MULTI-PRODUCT RETAIL MARKETS

Robert Innes

University of Arizona

Stephen Hamilton

University of Central Florida

***Abstract:** Slotting fees are fixed charges paid by food manufacturers to retailers for access to the retail market. The practice is 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 extract rent in vertically integrated multi-good markets.*

*The authors would like to thank Jeff Perloff, Tim Richards, and Rich Sexton for helpful comments. We are happy to acknowledge financial support from the Food System Research Group at the University of Wisconsin, and from the US Department of Agriculture.

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

I. Introduction

Slotting fees, which are lump sum payments between food manufacturers and retailers, are becoming increasingly common in wholesale supermarket transactions. Food manufacturers pay these fixed fees to retailers in exchange for allocating shelf space to new products as well as for maintaining existing products on retailer's shelves (FTC, 2001). Recently, the practice of slotting fees has faced growing criticism by small food manufacturers, who claim the fees to be a flagrant form of rent extraction by large retailers (Prevor, 2000).

The academic literature offers a number of theories to explain why and when slotting fees emerge, and each theory has identified various economic effects. On one side of this literature are theories focused principally on the charges for new product slots, or the so-called product "introduction fees". A number of scholars (e.g., Chu, 1992; Richards and Patterson, 2001; Lariviere and Padmanabham, 1997; Desiraju, 2001) argue that slotting fees serve as a signaling or screening mechanism whereby new product manufacturers, better informed than retailers about the likelihood of their product's success, pay an upfront bond to signal its quality. Such fees can lead to a better matching between consumers and products and can also raise manufacturers incentives for post-product-launch promotion (Chu, 1992). Others (most notably Sullivan, 1997) argue that slotting fees serve to price costly and limited 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 markets. These theories are based on rent extraction in imperfect markets, and apply generically to charges both for new product introductions and for the continued stocking of existing products through so-called "pay-to-stay fees". Shaffer (1991a) studies the use of slotting fees by duopolistic retailers who procure goods from competitive food manufacturers and compete in prices to sell them to consumers. He finds that a two-part tariff – a slotting fee combined with an elevated wholesale price – serves to

commit a retailer to setting a higher retail price, thus reducing the extent of retail competition to the retailer's advantage and to society's loss. Hamilton (2003) considers a competitive retail sector, but duopsonistic food manufacturers who compete in quantities to procure inputs. The retailer-manufacturer contract in this setting also combines a slotting fee with an elevated wholesale price, which is advantageous to a manufacturer because the higher wholesale price rationalizes more aggressive quantity competition in the upstream market for the input. In contrast to Shaffer (1991a), such slotting fees are pro-competitive.

Here, we focus on the role of slotting fees in an environment with noncompetitive distortions at both stages of marketing chain (manufacturing and retailing). In the upstream market, we consider two manufactured goods, one produced by a monopolist and the other supplied by a competitive industry. In the downstream market, duopolistic retailers sell the manufactured goods to consumers in a spatially differentiated, multi-product retail market. In this context, we study how "naked" slotting fees – charges imposed on the competitive fringe by agreement between the monopoly manufacturer and retailers – can be used to control the pricing of competitive producers to the advantage of the contracting parties.

Our observations on how slotting fees can be used to achieve the monopoly-cum-retailer optimum are consonant with the growing concern of "small" suppliers that the imposition of slotting fees by retailers impairs competition (FTC, 2001). The basic message of the paper contrasts sharply with that of Shaffer (1991a) and Hamilton (2003), who find contracts to be mutually agreeable to both manufacturers and retailers.

This work is closely related to the literature on vertical control. Winter (1993) considers a similar model with a single (monopoly) product, and duopoly retailers that select prices and a level of "service." The role of vertical contracts in this setting is to correct excessive retail price competition, and to obtain the optimal allocation of service. In contrast, we introduce a competitive "fringe" at the manufacturing level and examine how contracts in general – and slotting fees in particular – can be used by a monopolist to control the pricing of rival

manufactured goods.¹ There is also a substantial (and closely related) literature on the extension of monopoly power to other products through the use of tying arrangements in vertical contracts (e.g., Whinston, 1990; Carbajo, et al., 1990; Shaffer, 1991b). This literature focuses on the use of contracts by multi-product producers who seek to extend the advantage enjoyed by a monopoly supplied good to a full line of products.² The focus here is distinct from this literature, as contracts do not serve to broaden the base of products through which to acquire monopoly rents. Slotting fee contracts shift rent from *other firm's* goods to the monopoly supplied one.

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 of this form. Section III examines the (first-best) choices of a vertically integrated marketing chain and compares this outcome to the non-integrated equilibrium absent vertical contracts. Section IV characterizes the first-best slotting fee contracts and Section V concludes.

II. The Model

The model considers a vertically structured marketing chain with an upstream (wholesale) market and a downstream (retail) market. The upstream market consists of two manufactured goods. The first manufactured good (product 1) is produced by a monopolist and the second manufactured good (product 2) is produced by a competitive industry (or fringe). Production for both the monopolist and the fringe involves constant marginal cost, which we denote c^1 and c^2 , respectively.

The food manufacturers sell their products to duopolistic retailers, and each retailer is assumed to stock both products. The retailers subsequently compete for customers in the downstream market by selecting retail prices for both manufactured goods.

¹Adding retailer service (or shelf-space) choices to the present model yields some further insights into the effects of slotting fees (see our discussion in Section V); however, doing so does not qualitatively alter our 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.

Consumers (the number of whom is normalized to equal one) have preferences over both retailers and products. Specifically, consumers shop at a single retail store and choose which store to frequent according to a preference parameter θ to be discussed shortly. Given a retail choice, $j \in \{1,2\}$, and consumption bundle, (y^1, y^2) , a consumer obtains the utility:

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

where y^i is the quantity of good i purchased, and p_j^i is the price of good i at retail location j .

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

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

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 -type 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:

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

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

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 examine how equilibrium outcomes without contracts depart from the optimal resource allocation of an integrated marketing chain (the "first best"). We then characterize slotting fee contracts that improve the position of both the monopolist and the retailers by achieving this integrated (first-best) outcome.

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

Before studying this model, it is instructive to briefly consider the nature of the optimal contract in a setting with a single manufactured good. Suppose a single monopoly manufacturer sells a wholesale good to a duopolistic retail sector. Letting p^* denote the integrated monopoly retail price, the following result can be shown:⁴

Observation 1. If retailers compete over a single (monopoly wholesaler) product, (a) there is a wholesale price, $w^* \in (c^1, p^*)$, 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 is straightforward. With marginal cost wholesale pricing ($w^1 = c^1$), each retailer prices below the integrated monopoly level in an attempt to attract customers from her rival; hence, an above-cost wholesale price, $w^1 = w^*$, is needed to elicit optimal retail pricing. Absent contracts, the monopolist, who seeks to maximize his wholesale (rather than integrated chain) profit, generally sets a different wholesale price. Hence, the optimal contract elicits a first-best outcome by stipulating a *different* wholesale price than the one that maximizes the monopolist's profit, and this requires the monopolist be compensated with a negative slotting fee (i.e., a payment from retailers to the manufacturer). Retail competition in multiple products is thus necessary to provide an interesting motive for the *positive* slotting fees observed in practice.

III. First-Best and No Contract Outcomes

A vertically integrated monopoly solves the following problem:

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

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

where $y^i(\cdot) \equiv \arg \max \{u(y^1, y^2) - \sum_i p^i y^i\}$. The solution to this problem yields the maximum profit available in this market, $\Pi^* \equiv \Pi(p^{1*}, p^{2*})$, which we refer to throughout as the first-best.

We first establish that simple wholesale pricing (absent contracts) cannot give rise to a first-best outcome, thereby motivating our study of supplier-retailer contracts.⁵ In doing so, we describe the retailer pricing incentives that are central to the design of contracts. Specifically, consider the choice problem of retailer 1 (R1):⁶

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

where $w^2=c^2$ and

$$\begin{aligned} \phi(p^1, p^2; \bar{u}_2) &\equiv \text{market share of R1, given R2's price selection (and attendant consumer} \\ &\quad \text{utility } \bar{u}_2) \\ &= \frac{\bar{\theta} + u^*(p^1, p^2) - \bar{u}_2}{2\bar{\theta}}. \end{aligned}$$

The first-order necessary conditions for a solution to this problem are:

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

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

where

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

The retailer's pricing incentive departs from that of the vertically integrated chain in two regards. First, higher retail prices (ceteris paribus) prompt marginal consumers to switch to the other retailer. This loss of store traffic is costly to the retailer, but of no concern to the vertically integrated chain, and the second terms in (5) and (6) capture these effects. Second, because the

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.

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 expressions (5) and (6) captures these effects.

Following Winter's (1993) logic, the wholesale price of good 1 can 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 (5) vanish, then R1 will set p^1 optimally:

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

Nevertheless, with w^1 set per equation (8), the last terms in (6) do not vanish when p^2 is set equal to its integrated optimum, p^{2*} . To see this, note that

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

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 $u_{12}(\cdot) \leq 0$). This is an intuitive result. The retailer prefers to set a lower than optimal price for good 2, because reducing the price of the fringe good serves to attract customers from the rival retailer and the opportunity cost of the reduced price on the (in-store) demand for the substitute good 1 is smaller for the retailer than it is for the integrated chain (i.e., $w^1 > c^1$).

Proposition 1. Wholesale pricing alone cannot achieve the first-best outcome with multi-product retailers. Closed territorial division of the market, with $w^1 = c^1$, can achieve 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, not retailers, determine where to shop – and retailers cannot identify a consumer's preference location – we assume territorial division of the market to be impossible.

IV. Contracts

Because a first-best cannot be achieved without contracts, there is potential for contracts to deliver collective gains. We follow the standard approach in the bargaining literature (see, e.g., Macleod and Malcomson, 1995) and assume that contract terms are determined as a bargaining outcome. Also, because the issue of interest here is on the form that a first-best contract can take, we do not describe the precise form of the bargaining game in detail. Instead, we simply assert that the game has a unique subgame perfect bargaining equilibrium that splits collective gains from contract implementation according to a known rule (as in Rubinstein, 1982; Shaked, 1987; and others).

It is often the case that the first-best outcome can be implemented with a variety of contract forms. This is the case here as well. For example, a "naked" resale price maintenance (RPM) contract that stipulates the first-best price pair (p^1, p^2) can clearly obtain the first-best, 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, $w^1 > c^1$.

Our focus here is on contracts that impose slotting fees on the competitive fringe. Specifically, we examine contracts that mandate fixed fees for fringe suppliers to gain access to the retail market.

Consider a contract that compels the retailers to charge competitive fringe suppliers a lump-sum slotting fee of $f^2 > 0$. Each retailer then faces fringe suppliers competing in wholesale prices (w^2) for exclusive access to his retail market at the cost f^2 , and the retailer selects among suppliers with the lowest prices on offer. The fixed slotting fee thus confronts the retailer with a wholesale price that satisfies, in equilibrium, the zero-profit condition of the competitive fringe,

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

In (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, in turn, can be exploited to correct the 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 f^1 transfer distributes rents according to the bargaining equilibrium. Our task is to find wholesale prices that yield a first-best outcome, and given these prices, the corresponding contract terms that support them. For the case of symmetric retailers, we seek a wholesale price pair (w^1, w^2) that satisfies (5) and (6) at $p^1=p^{1*}$, $p^2=p^{2*}$, and $\bar{u}_2 = u^*(p^{1*}, p^{2*})$.⁷ Given this first-best wholesale price pair (w^{1*}, w^{2*}) , the slotting fee contract must satisfy

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

Solving this problem yields:

Proposition 2. A naked 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 that the retailers charge asymmetric slotting fees to the monopoly (good 1) supplier and the fringe (good 2) suppliers. Indeed, the implicit rent transfer in such a contract can result in a negative "fee" for the monopolist – a payment made from the retailer to the monopolist – at the same time the fringe is charged a positive slotting fee. In some respects, this feature is 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). Nonetheless, as we demonstrate below, such asymmetry in the retail practice -- and the attendant transparency of the contract's anti-competitive effect -- is by no means necessary to achieve the first-best outcome.

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, $f^2 > 0$ by eq. (10).

(B) Naked Symmetric Slotting Fees with Resale Price Maintenance. A symmetric slotting fee ($f=f^1=f^2$) also can be used to raise the fringe good's wholesale price to the desired level described above. However, such a contract in general cannot achieve the desired distribution of rents between the retailers and the monopolist. To support symmetric slotting fees, the monopolist's (good 1) wholesale price can be used as the instrument for rent distribution, and RPM can provide the monopolist with the flexibility to use the wholesale price for rent distribution while maintaining the proper good 1 retail pricing incentive. The monopoly-retailer contract thus consists of (i) symmetric slotting fees, f ;⁹ (ii) a good 1 resale price stipulation, $p^1=p^{1*}$; and (iii) a 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 to support the fringe wholesale price w^2 . The retailer incentive constraint requires that (6) be satisfied at $p^2=p^{2*}$ (and $p^1=p^{1*}$). Finding the wholesale price pair (w^1, w^2) that satisfies (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 (i) resale price maintenance, $p^1=p^{1*}$; (ii) a positive slotting fee and fringe price markup, $f > 0$ and $w^2 > c^2$; and (iii) a positive monopoly markup, $w^1 > c^1$.

(C) Naked Symmetric Slotting Fees with a Quantity Provision. Rather than directly imposing a retail price on its client retailers – a practice of dubious legality (Shaffer, 1991a; Winter, 1993;

⁹In a more detailed model, the slotting fee can be tied to shelf-space and, thus, be different for the monopolist and the fringe. However, symmetry then restricts the slotting fee to reflect common prices of shelf-space across suppliers. An optimal (integrated chain) shelf-space allocation would 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.

Butz and Kleit, 2001) – the monopolist can elicit optimal retail pricing using a combination of symmetric slotting fees and a fixed quantity commitment (for its good 1 supply).¹⁰ As above, the level of the (symmetric) slotting fee is set to control the retail pricing of the fringe (good 2) product, only here the quantity commitment is used in place of RPM as an indirect instrument to control the good 1 retail price. Profits can then be freely distributed by the appropriate selection of the wholesale price, w^1 .

Formally, let $q = y^1(p^{1*}, p^{2*})/2$ denote the optimal quantity commitment. This implies the constraint (for retailer 1) becomes,¹¹

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

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

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

The first order condition for R1's optimum is:

$$(15) \quad \phi y^2 + (p^2 - w^2)(\phi y_2^2 + y^2 \phi_2) + (q + (p^2 - w^2)(\phi y_1^2 + y^2 \phi_1)) \left(\frac{\partial p^1}{\partial p^2} \right) = 0$$

where

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

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

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, it is suboptimal for the retailer 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).

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 equation (15), which therefore uniquely solves problem (14).

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

V. Conclusion

This paper shows how a monopolistic supplier of one good can use "naked" slotting fees – fixed charges imposed on competitive suppliers of *other* goods – to achieve the vertically integrated multi-good monopoly rent when faced with imperfectly competitive retailers. The anti-competitive effects of such a practice suggest that slotting fees merit careful scrutiny under prevailing anti-trust laws. In the language of the U.S. anti-trust doctrine (see Cannon and Bloom, 1991), this paper demonstrates that slotting fees may be used to achieve predatory discrimination, even when the fees are symmetrically imposed on all suppliers. If it is indeed the case that slotting fees are paid predominantly by "small" suppliers and at the initiative of retailers, and claims to this effect are broadly and increasingly common (Gibson, 1988; Therrien, 1989; Prevor, 2000; Rao and Mahi, 2003), then the anti-competitive conclusions of this paper bear empirical attention.

The analysis developed in this paper has natural generalizations. For example, retail outlets may not only make pricing decisions, but also allocate shelf-space.¹³ In this case, slotting fee contracts may have even more pernicious effects. Absent contracts, retailer shelf-space decisions tend to be pro-competitive, as the retailer's incentive to allocate greater shelf-space to products with larger retailer margins provides suppliers with an additional deterrent to elevating wholesale prices. Nonetheless, the shelf-space allocation decision has no qualitative implications whatsoever on the outcome of naked slotting fees. The optimal contracts would thus eliminate the pro-competitive effect of retailer shelf-space decisions by pre-stipulating shelf-space and charging for it, ostensibly, with slotting fees.

¹³Shelf-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.

It should be noted that the foregoing analysis has paid no attention to the enforceability of contracts. In particular, it may be desirable for a retailer to renege on the pledge to charge slotting fees for competitive fringe products. There are two possible resolutions to this potential 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 (and the retailers made worse off) by a retailer's departure from the contracted slotting fee.¹⁴ 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.¹⁵

Finally, the analysis has treated the imperfectly competitive manufacturing sector in its starkest form --that of a monopoly producer with a competitive fringe. If there are, instead, multiple oligopolistic manufacturers, then the qualitative conclusions of the analysis would 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, the outcome would 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.¹⁶ Slotting fees can serve such entry-deterrence purposes. However, adding such complications to the model does not fundamentally alter the logic of "naked" slotting fees.

¹⁴This 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.

¹⁵Characterizing how this can be done is beyond the scope of this note, but would involve a slightly 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.

¹⁶See 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

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

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

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

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:

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

(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:

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

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

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

where the second inequality is due to $\text{argmax } J^M(w) \neq w^*$, and revealed preference. QED.

Proof of Proposition 2. After some tedious manipulations, it can be seen that the following wholesale price markups will solve (5) and (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 $y_j^i = \partial y^i / \partial p^j$ and $\phi_j = \partial \phi / \partial p^j = -(2\bar{\theta})^{-1} y^j(p^1, p^2)$ for $(i,j) \in \{1,2\}$,

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

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

The inequalities in (A6)-(A7) are due to $y_i^i < 0$ (for $i=1,2$); $\phi_i < 0$ (for $i=1,2$); with $u_{12}=u_{21} \leq 0$ (by assumption), $y_j^i \stackrel{\leq}{=} -u_{ij}=0$ (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) and (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 (A5) wholesale prices, $w^{1*} > c^1$ and $w^{2*} > c^2$, that implement the first-best. QED.

Proof of Proposition 3. Solving (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

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

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

The inequalities in (A9) and (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 (12) and (A8) wholesale prices that implement the first-best, with $w^2 > c^2$ by (A8)-(A10), and $w^1 > c^1$ by (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 $q=y^1\phi$),

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

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

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.

References

- Bernheim, B. and M. Whinston. "Exclusive Dealing." *Journal of Political Economy* 106 (1998): 64-103.
- Butz, D. and A. Kleit. "Are Vertical Restraints Pro- or Anticompetitive? Lessons From Interstate Circuit." *Journal of Law & Economics* 44 (2001): 131-59.
- Calvin, L., R. Cook, M. Denbaly, C. Dimitri, L. Glaser, C. Handy, M. Jekanowski, P. Kaufman, B. Krissoff, G. Thompson, S. Thornsbury. "U.S. Fresh Fruit and Vegetable Marketing." Ag. Economic Report Number 795, U.S.D.A. Economic Research Service (2001).
- Cannon, J. and P. Bloom. "Are Slotting Allowances Legal Under Antitrust Laws?" *Journal of Public Policy & Marketing* 10 (1991): 167-86.
- Carbajo, J., D. de Meza, and D. Seidmann. "A Strategic Motivation for Commodity Bundling." *Journal of Industrial Economics* 38 (1990): 283-97.
- Chu, W. "Demand Signaling and Screening in Channels of Distribution." *Marketing Science* 11 (1992): 327-47.
- Desiraju, R. "New Product Introductions, Slotting Allowances and Retailer Discretion." *Journal of Retailing* 77 (2001): 335-58.
- Freeman, L. and J. Myers. "Grocery Fee Hampers New-Product Launches." *Advertising Age* (August 3, 1987).
- Federal Trade Commission. "Report on the Federal Trade Commission Workshop on Slotting Allowances and Other Marketing Practices in the Grocery Industry." (Feb. 2001).
- Gibson, R. "Supermarkets Demand Food Firms' Payments Just to Get on the Shelf." *Wall Street Journal* (Nov. 1, 1988): 1.
- Hamilton, S. "Slotting Allowances as a Facilitating Practice by Food Processors in Wholesale Grocery Markets: Profitability and Welfare Effects." *American Journal of Agricultural Economics* 85 (2003): 797-813.
- Lariviere, M. and V. Padmanabham. "Slotting Allowances and New Product Introductions." *Marketing Science* 16 (1997): 112-28.

- Macleod, W.B. and J. Malcomson. "Contract Bargaining with Symmetric Information." *Canadian Journal of Economics* 28 (1995): 336-67.
- Prevor, J. "Dictates from Retailers." *Produce Business* (September, 2000): 8.
- Rao, A. R. and H. Mahi. "The Price of Launching a New Product: Empirical Evidence on Factors Affecting the Relative Magnitude of Slotting Allowances." *Marketing Science* 22 (2003): 1-23.
- Reiffen, D. "On the Equivalence of Resale Price Maintenance and Quantity Restrictions." *International Journal of Industrial Organization* 17 (1999): 277-88.
- Richards, T. and P. Patterson. "Slotting Allowances as Real Options: An Alternative Explanation." *J. Business* (2002).
- Rubinstein, A. "Perfect Equilibrium in a Bargaining Model." *Econometrica* 50 (1982): 97-109.
- Shaffer, G. "Slotting Allowances and Resale Price Maintenance: A Comparison of Facilitating Practices." *RAND Journal of Economics* 22 (1991a): 120-135.
- Shaffer, G. "Capturing Strategic Rent: Full-Line Forcing, Brand Discounts, Aggregate Rebates, and Maximum Resale Price Maintenance." *Journal of Industrial Economics* 39 (1991b): 557-75.
- Shaked, A. "Opting Out: Bazaars Versus 'Hi-Tech' Markets." Theoretical Economics Discussion Paper 87/159, London School of Economics (1987).
- Sullivan, M. "Slotting Allowances and the Market for New Products." *Journal of Law & Economics* 40 (1997): 461-93.
- Terrien, L. "Want Shelf Space at the Supermarket? Ante Up." *Business Week* (August 5, 1989): 60.
- Whinston, M. "Tying, Foreclosure and Exclusion." *American Economic Review* 80 (1990): 837-59.
- Winter, R. "Vertical Control and Price Versus Nonprice Competition." *Quarterly Journal of Economics* 108 (1993): 61-76.