Naked slotting fees for vertical control of multi-product retail markets

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Abstract

Slotting fees are fixed charges paid by food manufacturers to retailers for access to the retail market. This note considers this practice in the context of multi-product markets with imperfectly competitive retailers, a monopoly supplier of one good, and competitive suppliers of other goods. We show how the monopolist and the retailers can use "naked" slotting fees–charges imposed on the suppliers of *other* goods–to obtain vertically integrated monopoly profits.

Keywords: Slotting fees; Vertical contracts; Monopolization

1. Introduction

Slotting fees, which are lump-sum payments made by food manufacturers to grocery retailers, are becoming increasingly common in wholesale supermarket transactions. Food manufacturers pay slotting 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, 2004; 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 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. Such a contract is advantageous to the manufacturer because the higher wholesale price implicitly precommits him to more aggressive quantity competition in the upstream market for the input. In contrast to Shaffer (1991a), such 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, and imperfect competition in both the manufacturing and retailing sectors. 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 derive a role for "naked" slotting fees–charges imposed on the competitive fringe by agreement between the monopoly manufacturer and retailers–which can be used to control the pricing of competitive producers to the advantage of the contracting parties.[2]

[2] We borrow this terminology from Rasmusen et al. (1991), who describe "naked" exclusionary agreements that, like the contracts characterized here, are transparently designed to extract rents. Throughout, we also assume that the contracts are "naked" in the sense that they are observable to all. However, in Section 4.3, we discuss contract enforcement issues when the terms of retailer–fringe contracts cannot be verified by the monopolist.

The slotting fees that emerge in a multi-product retail setting are consonant with some anecdotal evidence on the practice. The slotting fees derived here can be asymmetric, but uniformly involve positive slotting fees on the fringe—even when the monopoly supplier pays a zero or negative fee. This is consistent with claims in the industry that large manufacturers do not pay slotting fees, but small manufacturers do. For example, it was learned from the FTC's action blocking the Heinz-Beechnut "baby food" merger that Gerber, the leading manufacturer of baby food, does not pay slotting fees, whereas both Heinz and Beechnut do. Because most U.S. retailers stock Gerber and either Heinz or Beechnut as a second brand, slotting fees are viewed as auction prices paid by Heinz or Beechnut to become a retailer's second brand. The "naked" slotting fees derived here also are in accord with the observed consternation of "small" suppliers over the imposition of slotting fees by retailers (FTC, 2001), as opposed to their mutual agreement in contracts (as in Shaffer, 1991a; Hamilton, 2003).

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 the underprovision 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.[3] There is also a substantial 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 multi-good producers who seek to extend the advantage enjoyed by a monopoly supplied good to a full line of products.[4] 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.

The remainder of the paper is organized as follows. Section 2 presents the model and discusses the centrality of multi-product marketing and retail competition to the emergence of positive slotting fees. Section 3 characterizes baseline outcomes, namely, the choices of a vertically integrated marketing chain and outcomes absent contracts. Section 4 characterizes slotting fee contracts that achieve the integrated optimum. Section 5 discusses policy implications, and Section 6 concludes.

2. The model

We consider a vertically structured marketing chain with an upstream (wholesale) market and a downstream (retail) market. In the upstream market, 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. Upstream producers sell their goods to duopolistic retailers, and each

[3] Adding 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 5); however, doing so does not qualitatively alter our results.

[4] Shaffer (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.

retailer is assumed to stock both products. The retailers subsequently compete for customers in the downstream market by selecting retail prices for both goods.[5]

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:

$$u(y^1, y^2) - \sum_{i=1}^{2} p^{ij} y^i \tag{1}$$

where y^i is the quantity of good i purchased, and p^{ij} is the price of good i at retail location j.

We assume that $u(\cdot)$ is increasing and concave with bounded first derivatives, and $u_{12} \leq 0$ (the goods are weak substitutes in consumption).[6] Choosing consumption optimally, a consumer at retailer j obtains the indirect utility,

$$u^{*j} \equiv u^*(p^{1j}, p^{2j}) = \max_{\{y^1, y^2\}} u(y^1, y^2) - \sum_{i=1}^{2} p^{ij} y^i. \tag{2}$$

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:

$$\theta \leq \theta^*\left(u^{*1}, u^{*2}\right) \Rightarrow \text{purchase from retailer 1},$$

$$\theta > \theta^*\left(u^{*1}, u^{*2}\right) \Rightarrow \text{purchase from retailer 2},$$

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. We then characterize slotting fee contracts that improve the position of both the monopolist and the retailers by achieving the integrated outcome.

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 consumer "reservation utility" constraint–an optimal two-part contract between the two firms would be straightforward: (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

[5] The two-product market that we envision may involve separate product categories (such as ready-to-eat cereal and breakfast bars) or a single product category (e.g., electric razors) with a monopoly differentiated product (e.g., Gillette) and a generic fringe.

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

negative "slotting fee" whereby the retailer pays the monopoly wholesaler for his share of profit. The latter charge is akin to a franchise fee, but inconsistent with the positive slotting fees of interest in this paper. This two-part (negative slotting fee) contract yields the integrated optimum with or without the "fringe" good, because a monopoly retailer that acquires the fringe good at cost ($w^2=c^2$) has no incentive to depart from monopoly pricing.

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 can be shown:[7]

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 obtains the integrated outcome by stipulating a different wholesale price than the one that maximizes the monopolist's profit, and this requires that the monopolist be compensated with a negative slotting fee (i.e., a payment from retailers to the manufacturer).

In sum, a negative slotting fee prevails under two circumstances: (1) when there is a single retailer for both goods; or (2) when two retailers compete to sell a single good. Hence, for contracts that implement the integrated optimum, retail competition in multiple products is necessary to provide a motive for the positive slotting fees observed in practice.

3. Integrated and no contract outcomes

Returning to our multi-product retail duopoly model, a vertically integrated monopolist solves the following problem:

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

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

[7] Proofs of Observation 1 and Proposition 2 below are contained in the appendix. Note that the model underpinning Observation 1–retail competition in a monopoly-supplied product–is quite extensively studied in the literature. Absent problems of contract observability or commitment, it is well known that a two-part contract can support integrated outcomes (see O'Brien and Shaffer, 1992; McAfee and Schwartz, 1994).

We first establish that simple wholesale pricing, absent contracts, cannot give rise to the integrated outcome, thereby motivating our study of supplier–retailer contracts.[8] 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):[9]

$$\max_{p^1,p^2} \pi_1(p^1,p^2;\underline{u}^2,w^1,w^2) \equiv \sum_{i=1}^{2}(p^i-w^i)y^i(p^1,p^2)\phi(p^1,p^2;\underline{u}^2)$$

$$=\Pi(p^1,p^2)\phi(p^1,p^2;\underline{u}^2)-\sum_{i=1}^{2}(w^i-c^i)y^i(p^1,p^2)\phi(p^1,p^2;\underline{u}^2) \tag{4}$$

where $w^2=c^2$, Π is defined in Eq. (3), and

$$\begin{aligned}\phi(p^1,\,p^2;\,\underline{u}^2) &\equiv \text{market share of R1, given R2's pricing}\\ &\quad\text{(and attendant consumer utility } \underline{u}^2)\\ &=\left[\bar{\theta}+\theta^*(u^*(p^1,\,p^2),\,\underline{u}^2)\right]/2\bar{\theta}=\left[\bar{\theta}+u^*(p^1,\,p^2)-\underline{u}^2)\right]/2\bar{\theta}.\end{aligned}$$[10]

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

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

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

where

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

The retailer's pricing incentive departs from that of the vertically integrated chain for two reasons. 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. The second terms in (5) and (6) capture 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 expressions (5) and (6) captures these effects.

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

[9] Choices of retailer 2 are symmetric and thus omitted.

[10] The R1 market share gives the fraction of consumers with $\theta\leq\theta^*(\cdot)=u^{*1}-u^{*2}$, which takes the indicated form due to our premise of uniformly distributed preferences on $[-\bar{\theta},\,\bar{\theta}]$.

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, because $w^2=c^2$, R1 will set p^1 optimally whenever w^1 is chosen so that all but the first term in (5) vanish. Namely,

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

Nevertheless, with w^1 set per Eq. (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

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

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 $\partial y^1/\partial p^2 \geq 0$ (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 (given $w^1>c^1$).

Proposition 1. *Simple wholesale pricing cannot achieve the integrated optimum with multi-product retailing. Closed territorial division of the market can achieve the integrated outcome.*

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 that territorial division of the market is impossible.

4. Contracts

Because the integrated outcome cannot be achieved absent contracts, there is potential for contracts to deliver collective gains. We assume that contract terms are determined by bargaining, following standard approaches in the bargaining literature (see, for example, Macleod and Malcomson, 1995). Also, because the issue of interest here is the form that the joint-profit maximizing contract can take, we do not describe the precise form of the bargaining game. Instead, we simply assume 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).[11]

[11] The distribution of rents will depend on the order of play in the bargaining game, as it would in a one-shot game of take-it-or-leave-it contract offers. In our model, it is arguably natural to assume that the monopoly supplier moves first.

It is often the case that the joint profit-maximizing outcome can be implemented with a variety of contract forms. This is true 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 achieve the first-best, with rent distributed using either (1) a suitable above-cost good-1 wholesale price, $w^1 > c^1$, or (2) a negative slotting fee whereby retailers transfer rents to the monopoly (good 1) supplier.

We focus only on contracts that impose positive slotting fees on the competitive fringe. There are a number of ways in which to think about these fees. They could be charged on each unit of output $\underline{f}$, raising the wholesale price from c^2 to $w^2 = c^2 + \underline{f}$. Perhaps more realistically, the fees could be combined with quantity commitments, so that retailers sign sets of contracts, each stipulating a quantity (q), a fixed slotting fee ($f = \underline{f}q$) and a wholesale price (w^2). Because fringe suppliers are competitive, a retailer can and will bid the wholesale price down to exhaust all fringe profit, $w^2 = c^2 + \underline{f}$. Alternately, each retailer can solicit an exclusive supply contract with a single fringe supplier, requiring a lump-sum slotting fee of $f^2 > 0$. Fringe suppliers then compete in wholesale prices (w^2) for exclusive access to the retailer's market at the cost f^2. The retailer, in turn, 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 fringe,

$$\left(w^2 - c^2\right) y^2\left(p^1, p^2\right) \phi(\cdot) = f^2. \tag{10}$$

Whether the monopoly–retailer contract requires a slotting fee that is per-unit ($\underline{f}$) or lump-sum (f^2), the fees support an above-cost wholesale price, $w^2 > c^2$.[12] An elevated wholesale price, in turn, can be exploited to correct the retailers' incentives to under-price the fringe product. For simplicity in what follows, we assume that the monopoly–retailer contract stipulates the lump-sum fee f^2.

4.1. Naked asymmetric slotting fees

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, (w^{1*}, w^{2*}). Given these prices, there are corresponding contract terms that support them of the form,

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

Formally, we assume that there are unique solutions to the retailers' first-order optimality conditions, (5) and (6), for relevant wholesale prices (w^1, w^2) and competitor practices

[12] As will be made clear in a moment, "naked" slotting fees serve to contract fringe supply and increase the rent of the monopoly supplier. However, because fringe suppliers earn zero profits with or without slotting fees, there is no "rent extraction" from fringe suppliers per se; rather, rents are implicitly extracted from fringe consumers.

($\underline{u}^1$, $\underline{u}^2$). Given retail symmetry, we thus seek a pair (w^1, w^2) that satisfies (5) and (6) at $p^1=p^{1*}$, $p^2=p^{2*}$, and $\underline{u}^2=u^*(p^{1*}, p^{2*})$.[13] Doing so yields:

Proposition 2. *A naked slotting fee contract can support the first-best, with $w^1>c^1$ and $f^2>0$ (so that $w^2>c^2$).*[14]

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. This 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 discuss 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 integrated outcome.

4.2. Naked symmetric slotting fees

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.[15] To support symmetric slotting fees, the monopolist's (good 1) wholesale price can be used as the instrument for rent distribution, and an additional vertical restraint can be used to maintain the proper good 1 retail pricing incentive. The added vertical restraint can be either a resale price stipulation (RPM), $p^1=p^{1*}$, or a good 1 quantity provision, $y^1=y^1(p^{1*}, p^{2*})/2$. The slotting fee controls good 2 pricing. Such a contract can thus control retail pricing of both goods and distribute integrated chain profits (Π^*) between the retailers and the monopolist according to the bargaining equilibrium. For example:

Proposition 3. *The integrated optimum can be supported by naked symmetric slotting fee contracts with (i) a 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, $w^1>c^1$.*

[13] By symmetry, this wholesale price pair will also satisfy retailer 2's optimality conditions.

[14] The 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).

[15] In 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. More generally, opaqueness of a "naked" slotting fee's effect may impose constraints on the *difference* in shelf-space pricing, even if asymmetric charges are possible; in view of such constraints, desired rent distribution will again require the use of the other instruments discussed above.

4.3. A note on enforcing contracts

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 levy the prescribed slotting charges on competitive fringe products. There are three possible resolutions to this potential conflict.

First, in the case of asymmetric slotting fees, the monopolist could commit to dissolve the retailer contract if the retailer deviates from the stipulated fringe slotting fee. To the extent that the retailer has any bargaining power at all (so that it obtains a positive share of net gains from the contract, however small), the retailer will strictly prefer contractual outcomes to no-contract outcomes and, hence, will not deviate. The question, however, is whether the monopoly can credibly make this commitment, because it is surely better off with small departures from the contract than with no contract at all.

Second, assuming that the foregoing commitment is not credible, consider the case of symmetric slotting fees and quantity-forcing, as described in Proposition 3. In this case, any departures from the contractually stipulated fee for the competitive fringe can be contractually punished by a reduction in the slotting fee paid by the monopolist. This mechanism is clearly credible, and deters any retailer deviations; the monopolist can only be made better off (and the retailers made worse off) by a retailer's departure from the contracted slotting fee. This built-in enforcement mechanism suggests an inherent advantage of a symmetric naked slotting fee contract (Proposition 3) vis-à-vis its asymmetric counterpart (Proposition 2).

However, both of these enforcement mechanisms presume that the monopolist can verify a retailer's contract terms with fringe suppliers. In practice, such terms may not be verifiable and the monopolist may have to enforce the naked slotting fee by inferring contract violations from a retailer's departure from integrated good 2 retail pricing (i.e., $p^2 \neq p^{2*}$). Moreover, the overtly anti-competitive nature of such cross-market price controls may rule them out. If so, then we are left with a third approach to contract enforcement: Using a combination of resale price maintenance (and/or fixed quantity), wholesale price, and fixed transfer contract terms, the retailers can be provided the needed *incentive* to set an optimal slotting fee for the fringe.

Specifically, consider a game in which (1) the monopolist first signs symmetric RPM contracts with the retailers, stipulating a wholesale price (w^1), retail price ($p^1 = p^{1*}$), and fixed transfer/slotting fee (f^1), but no cross-market (good 2) requirements; (2) retailers sign (or not) two-part contracts with competitive fringe suppliers; (3) retailers set retail prices; and (4) production and trade occur. Due to the logic of Shaffer (1991a), retailers have incentives to sign slotting fee contracts with fringe suppliers (in Stage 2) that yield above-cost wholesale prices and thereby implicitly precommit them to higher good 2 retail prices (in Stage 3). The challenge for the monopolist is to design its good 1 contract terms so as to *motivate* its retailer to sign *optimal* contracts with its fringe suppliers—that is, slotting fees that support integrated pricing, $p^2 = p^{2*}$. When the goods are substitutes (as assumed here), this can be done by offering retailers a relatively large good 1 margin, $p^{1*} - w^1$, which elevates the retailers' incentive to increase good 1 demand by raising their good 2 retail prices (p^2). In a companion paper (available upon request), we completely characterize RPM contracts that elicit optimal naked slotting fees in this way.

5. Policy implications

While the anti-competitive effects of "naked slotting fees" are clear, what is the alternative? If all vertical contracts are prohibited–requiring simple wholesale pricing by the monopolist–it is well known that double-marginalization will yield a retail price for the monopoly-supplied good that is above the monopoly level. Hence, vis-à-vis no contracts, allowing contracts that support integrated outcomes may or may not be welfare-enhancing (by lowering the good 1 price, but raising the good 2 price).

Let us suppose instead that two-part monopoly–retailer contracts are allowed–thus eliminating double-marginalization–but that all other restraints are prohibited, notably including naked slotting charges on the competitive fringe. Then, vis-à-vis integrated outcomes, *prices will tend to be lower*. The fringe price will be lower ($p^2 < p^{2*}$) due to retailers' customer-stealing incentives (at the wholesale price c^2). Hence, the monopolist sets its wholesale price in view of effects in two domains: (1) integrated profit in the monopoly good market (favoring a wholesale price that, loosely speaking, supports a price close to p^{1*}), and (2) incentives for retailers to raise p^2 toward its integrated level. Consider the latter incentives. When the two goods are substitutes (as assumed here), an increase in p^2 raises good 1 demand and, hence, is more profitable to a retailer when his good 1 margin, $p^1 - w^1$, is higher. Moreover, the equilibrium good 1 margin rises as the monopolist lowers w^1, which also leads to a lower retail price p^1. In sum, by lowering its wholesale price, the monopolist prompts a lower retail price ($p^1 < p^{1*}$), but raises the good 2 retail price. This incentive effect is advantageous at the margin because the profit cost of a marginal deviation from integrated good 1 pricing is negligible, while the profit benefit of elevating p^2 toward its integrated level is strictly positive. The anti-trust implications are clear: Vis-à-vis unfettered "naked slotting fee" contracts, a policy that proscribes the imposition of contracts on the competitive fringe and allows only two-part monopoly–retailer contracts, will be welfare-enhancing.

6. 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 vertically integrated multi-good monopoly profits in the presence of imperfectly competitive retailers. The anti-competitive effects of such a practice suggest that slotting fees merit careful scrutiny under prevailing anti-trust laws.

A distinguishing symptom of the slotting fees characterized in this paper is that they are paid by "small" suppliers and at the initiative of retailers.[16] If this symptom prevails in practice, and claims to this effect are broadly and increasingly common (Gibson, 1988;

[16] Hamilton (2003) presents a model of slotting fees that, like ours, reflects imperfect competition in wholesale markets but, unlike ours, implies that slotting fees are paid at the initiative of suppliers, not retailers, and are pro-competitive. The distinguishing symptom of Hamilton's (2003) slotting fees–supplier initiation–seems to prevail in some cases, such as the market for bagged salads (Calvin et al., 2001). However, it is at odds with what is rapidly becoming a stylized fact of the slotting fee debate—consternation by small wholesalers over the undesired imposition of slotting fees by large retailers (see Prevor, 2000, and many others).

Therrien, 1989; Prevor, 2000; Rao and Mahi, 2003), then the anti-competitive conclusions of this paper may be of practical importance.

The analysis developed in this paper has natural generalizations. For example, retail outlets may not only make pricing decisions, but also allocate shelf-space.[17] 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, a shelf-space allocation decision by retailers does not reduce incentives for naked slotting fees. Indeed, optimal contracts would eliminate the pro-competitive effect of retailer shelf-space decisions by pre-stipulating shelf-space and charging for it, ostensibly, with slotting fees.

In addition, 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.[18] 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 as instruments for the monopolization of multi-product marketing chains.

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Appendix A

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

$$p^* = \text{argmax}\big(p - c^1\big)y(p) \Leftrightarrow y(p) + \big(p - c^1\big)\big(\partial y(p)/\partial p\big) = 0. \tag{A1}$$

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

[18] See Bernheim and Whinston (1998) for a complete development of this point.

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

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

yielding a solution $p^{\mathrm{R}}(w)$ that satisfies:

$$\partial J^{\mathrm{R}}()/\partial p = \left(\bar{\theta}+\theta^*\right)(y+(p-w)(\partial y(p)/\partial p)) - (p-w)y\,y = 0, \tag{A3}$$

with $\partial\theta^*/\partial p = -y$. For simplicity, we assume that the solution to (A3), and hence, $p^{\mathrm{R}}(w)$, is unique for relevant w. (Sufficient conditions for a unique solution are that $(1/y(p))$ is convex and $(yy+\theta(\partial y(p)/\partial p))\geq 0$ for $w<p<\underline{p}(w)\equiv p$: $p-w=-y/(\partial y(p)/\partial p)$.) By symmetry, the monopolist's wholesale price choice problem is:

$$\max_w J^{\mathrm{M}}(w) = (w-c^1)y(p^{\mathrm{R}}(w)). \tag{A4}$$

(a) Note that, at $w=p=p^*$, $\partial J^{\mathrm{R}}(p^*;\, p^*)/\partial p=(\bar{\theta}+\theta^*)(c^1-p^*)+\bar{\theta}(\partial y(p)/\partial p)>0$. At $w=c^1$, $\partial J^{\mathrm{R}}(p^*;\, c^1)/\partial p=-(p^*-c^1)yy<0$. By the intermediate value theorem, there is a $w^*\in(c^1,\, p^*)$ such that $\partial J^{\mathrm{R}}(p^*;\, w^*)/\partial p=0$, which, by symmetry and the uniqueness of (A3)'s solution, establishes part (a).

(b) If the solution to (A4) is $w=w^*$, then the integrated optimum is achieved without contract and no contracts will be signed. If the solution to (A4) is $w\neq w^*$, then optimal 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:

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

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

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

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

Proof of Proposition 2. After some manipulation, 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 $\partial\Pi/\partial p^1=\partial\Pi/\partial p^2=0$):

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

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

$$A_i = \Pi^*\phi\left[\phi_j y^i_i - \phi_i y^i_j\right]\geq 0, \qquad j\neq i \tag{A6}$$

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

The inequalities in (A6) and (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), $y_j^i \overset{s}{=} -u_{ij} \geq 0$ (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 integrated optimum. □

Proof of Proposition 3. Let $q = y^1(p^{1*}, p^{2*})/2$ denote the optimal quantity commitment, assumed (for simplicity) to commit both the seller (who agrees to supply exactly q) and the buyer (who agrees to market exactly q). This implies the constraint (for retailer 1),

$$y^1(p^1, p^2)\phi(p^1, p^2; \underline{u}^2) = q \Rightarrow p^1(p^2; \underline{u}^2). \tag{A8}$$

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

$$\max_{p^2} q(p^1(p^2; \underline{u}^2) - w^1) + (p^2 - w^2)y^2(p^1(p^2; \underline{u}^2), p^2)\phi(p^1(p^2; \underline{u}^2), p^2; \underline{u}^2) \tag{A9}$$

The first order condition for R1's optimum is:

$$\phi y^2 + (p^2 - w^2)(\phi y_2^2 + y^2\phi_2) + (q + (p^2 - w^2)(\phi y_1^2 + y^2\phi_1))\left(\frac{\partial p^1}{\partial p^2}\right) = 0 \tag{A10}$$

where

$$\frac{\partial p^1}{\partial p^2} = -\frac{\phi y_2^1 + y^1\phi_2}{\phi y_1^1 + y^1\phi_1}. \tag{A11}$$

To support the integrated optimum, we need a $w^2 = w^{2*}$ that satisfies (A10) at $p^2 = p^{2*}$, $\underline{u}^2 = u^*(p^{1*}, p^{2*})$, $p^1 = p^{1*}$ (by (A8) and the definition of q) and $\phi = 1/2$ (by symmetry of the equilibrium). (We assume that, for the optimal w^{2*} and $\underline{u}^2 = u^*(p^{1*}, p^{2*})$, there is a unique solution to Eq. (A10), which therefore uniquely solves problem (A9).) Evaluating (A10) at the latter values by substituting Eq. (A11) 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

$$(y_1^1\phi + y^1\phi_1)^{-1}\{C - (w^2 - c^2)B\} = 0, \tag{A10$'$}$$

where $B>0$ is defined in (A7),

$$C = \phi\Pi^*\left[y_1^1\phi_2 - y_2^1\phi_1\right]>0, \tag{A12}$$

and the inequalities follow from $\phi=1/2>0$, (A7), $\Pi^*>0$, $y_i^i<0$, $y_j^i\geq 0$ $(j\neq i)$, and $\phi_i<0$. From (A10′) and (A12), w^{2*} satisfies: $(w^2-c^2)=C/B>0$, which implies that $f=(w^2-c^2)y^2(p^{1*},\ p^{2*})/2>0$. The monopoly wholesale price, $(w^1-c^1)>0$, is set to obtain the desired rent distribution,

$$\left(w^1 - c^1\right)y^1\left(p^{1^*}, p^{2^*}\right) = 2f + \pi^{\mathrm{M}}, \tag{A13}$$

where $0<\pi^{\mathrm{M}}<\Pi^*$ is the monopolist's bargained profit. □

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