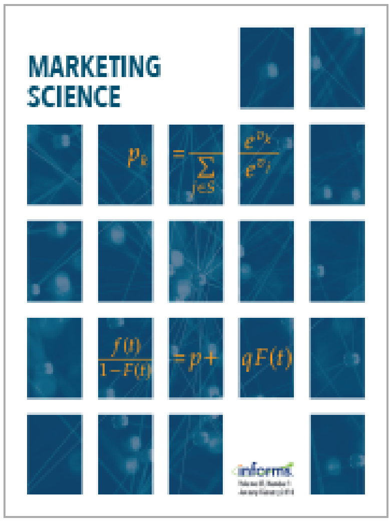

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Research Note

The Effects of Costs and Competition on Slotting Allowances

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We consider the optimal two-part tariff contract between a manufacturer and a retailer. We show that retail competition (in the presence of either fixed costs or bargaining power) may lead to slotting allowances in an optimal contract, even with a monopoly manufacturer and no information asymmetry. On the other hand, slotting allowances do not arise with a monopoly retailer and no information asymmetry, whether the manufacturer is a monopoly or not. We also show that more intense retail competition, higher retail bargaining power, larger retailer fixed costs, lower marginal costs of retailing, as well as larger relative retailer size (whether coming from a location or operating advantage), have a positive impact on the incidence and the magnitude of slotting allowances. The opposing effects of the fixed and marginal operating costs on slotting allowances, as well as the impact of competition and bargaining power on profits, underscore the importance of careful definitions of these variables in empirical research.

Key words: slotting allowances; bargaining power; distribution channels; channel coordination; competition; pricing; retailing; wholesaling
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1. Introduction

It is frequently noted that slotting allowances are becoming an increasingly popular practice.[1] According to the Federal Trade Commission (FTC) report (2003), the average amount of slotting allowances per item per retailer and per metropolitan area range from $2,313 to $21,768, depending on the retailer and area. Trade and academic literature suggest a variety of reasons for slotting allowances: information asymmetry, manufacturer competition, retailer competition, operational costs, size of retailer, retailer market or bargaining power, retailer concentration, etc.[2] Yet, some observed regularities regarding the use of slotting allowances remain without satisfying explanations. For example, although retailer bargaining power has been frequently cited as the reason for slotting allowances, traditional supermarkets use slotting allowances extensively. On the other hand, stores such as Wal-Mart and Costco, which are very large retailers having tremendous bargaining power with manufacturers, never ask for slotting allowances (FTC 2001). Another observation is that while retail shelf space has similar cost for a particular retailer, especially within a single product category, slotting allowances vary widely with the brand/product within the same retailer and category (FTC 2003, Sudhir and Rao 2006). Furthermore, according to FTC (2001), the categories with heavy use of slotting allowances are dry groceries, beverages, household maintenance products, and snacks, while fresh meats/seafood, produce, and deli are subject to only "light" usage of slotting allowances. One might find this puzzling because most retail chains stock a large selection of brands in the above categories with heavy use of slotting allowances, but not in categories with "light" use of slotting allowances. This can be viewed as contradicting the perceived exclusionary role of slotting allowances.

This paper examines multiple factors affecting optimal use of slotting allowances when all participants have complete information about products and sheds

[1] We take a broad view of slotting allowances and consider pay-to-stay fees, as well as the manufacturer trade promotions that have the monetary value to retailer not depending on the quantity purchased by the retailer, to be a type of slotting allowances.

[2] See Bloom et al. (2000) and Rao and Mahi (2003) for a broad survey of the arguments.

some light on the above examples. In particular, it explores the effects of retailer and manufacturer competition, bargaining power, fixed and marginal costs of retailing, and retailer size on slotting allowances.

We consider an environment comprising either one or two manufacturers, each producing a single product, and either one or two retailers who might carry neither, one, or both products. We demonstrate that retailer competition is essential for the optimality of slotting allowances, while manufacturer competition is not.[3] In other words, regardless of manufacturer competition and retailer bargaining power, slotting allowances cannot arise in the equilibrium in the absence of retail competition. On the other hand, we demonstrate that retailer competition can lead to slotting allowances even with a monopoly manufacturer. Examining categories in which slotting allowances were and were not observed in the FTC report (2001), one can note that retailer competition in fresh meats, produce, and deli is much weaker than retailer competition in all the categories supporting high slotting allowances (due to perishability). This reasoning may also apply to the supermarkets versus Wal-Mart and Costco observation.[4]

To further investigate the conditions on retail competition under which slotting allowances arise, we model the two retailers as being differentiated along a Hotelling line segment. We consider the effects of retail competition intensity by changing the distribution of consumers along the Hotelling line and introduce a bargaining power parameter. This parameter is defined as the ability of the retailer to appropriate a larger fraction of the surplus that it brings to the channel.[5]

We show that fixed retailer costs and intense retail competition are positively related to the incidence and size of slotting allowances. When the level of retailer competition is fixed and retailers have no bargaining power, slotting allowances are directly linked with the compensation of the retailers' fixed costs. Greater retailer bargaining power increases slotting allowances in the presence of retail competition but reduces the effect of fixed costs on slotting allowances. However, the extent of retail competition always enters the optimal amount of slotting allowances. A given pair of retailers may face different degrees of competition in different product categories or even between different brands of the same category (since different brands may be purchased by different consumer segments). Therefore, our model helps to understand why slotting allowances might differ within the same retailer and category, and why this difference might not be fully explained by costs.

Shaffer (1991) shows how slotting allowances can arise when manufacturers are allowed to offer exclusive contracts and both manufacturers and retailers compete, but he does not focus on the differential impact of retailer and manufacturer competition. In fact, the literature has often asserted that either the manufacturer competition (Shaffer 1991, Sullivan 1997) or retailer bargaining power (Chu 1992) lead to slotting allowances.[6]

Note that while some researchers view slotting allowances as potentially decreasing product distribution, in our model the effect of slotting allowances turns out to be one of broadening the distribution of the manufacturer's product and, at the same time, increasing retail and wholesale prices. As a result, slotting allowances may either enhance or harm social welfare, depending on the magnitude of the retailer's fixed costs.

To see the effect of the relative retailer size on slotting allowances, we also consider retailer asymmetry by allowing retailers to have either different marginal costs of selling, in which case one retailer has an operating efficiency advantage, or different locations on the Hotelling line segment, in which case

[3] Following Shaffer (1991), Chu (1992), and Lariviere and Padmanabhan (1997), we define slotting allowances as a negative fixed transfer in a two-part tariff contract between a manufacturer and a retailer.

[4] Whole Foods Market, Inc., is another example of a retailer that does not ask for slotting allowances. Arguably, its customer base is less price sensitive (does not shop around as much as the customer base of a regular supermarket), which means that it is in a condition of weaker competition as compared to regular supermarkets.

[5] This definition allows us to consider retail bargaining power and retail competition as independent variables. It is important to note that this definition of bargaining power may differ from "market power." We later also discuss the effects of bargaining power when defined slightly differently.

[6] Information asymmetry can also result in the existence of slotting allowances (Chu 1992, Lariviere and Padmanabhan 1997, Desai 2000). While some literature considered multistage contracting where slotting allowances are offered prior to negotiation on product pricing (e.g., Messinger and Chu 1995, Desraju 2001, Shaffer 2005, Marx and Shaffer 2006), this paper assumes that retailers and manufactures negotiate on a single contract involving slotting allowance and wholesale price at the same time (as in Shaffer 1991, Chu 1992, Lariviere and Padmanabhan 1997). Note that when each channel member is a monopoly, double marginalization can be a source of channel inefficiency and may be addressed through quantity discounts (Jeuland and Shugan 1983), in particular, through two-part tariff with a positive transfer from the retailer to the manufacturer. Quantity discounts and two-part tariffs can also be used to address this problem when the retailer is not a monopoly (Mathewson and Winter 1984, Raju and Zhang 2005). However, the increased margins in a longer channel may increase channel profits in the case of competition in each distribution level (McGuire and Staelin 1983, Moorthy 1988, Coughlan and Wernerfelt 1989). In a broader context of channel coordination, franchise agreements (Lal 1990, Desai and Srinivasan 1995), product returns (Padmanabhan and Png 1997), bargaining power (Iyer and Villas-Boas 2003), retail price ceiling/floor (Iyer 1998), and product line design (Villas-Boas 1998) have been also considered as channel-coordination devices.

one retailer has a location advantage. Even though we restrict both retailers to have the same bargaining power parameter, we find that the retailer with either an operating efficiency or a location advantage may receive a higher slotting allowance. Because a retailer with a marginal cost or a location advantage also has a higher market share, we conclude that a retailer's size might be positively correlated with both the incidence and the magnitude of slotting allowances.

The results in this paper underline the importance of careful consideration of how observable market or firm characteristics (such as retail or manufacturer concentration, profits, and costs) translate to the above-discussed variables that we theoretically link with the existence or magnitude of slotting allowances. For example, retail concentration may be positively correlated with retailer bargaining power but negatively correlated with the level of retail competition. Also, the potentially opposing effects of fixed and marginal costs may result in a similar problem.

2. The Model

We consider an environment comprised of either one or two manufacturers, each producing a single product, and either one or two retailers, each of which may carry neither, one, or both products. We assume that all contracts between manufacturers and retailers are simultaneously decided and revealed prior to the (simultaneous) setting of prices by the retailers. We restrict our attention to two-part-tariff contracts between each manufacturer and each retailer. Specifically, a contract between a manufacturer and a retailer is defined by the pair (T, w), where the retailer has to pay $T + wQ$ to the manufacturer if he purchases quantity Q. In this terminology w represents the wholesale price, and when $T < 0$, then $|T|$ is referred to as a slotting allowance. While the two-part-tariff structure of the contract is a restriction on the more general functional form of quantity-dependent payment schedule, we will show that it is general enough to achieve channel coordination in this model. Therefore, a two-part-tariff structure of the contract is not restrictive.

For model tractability, we assume that in the case of two manufacturers and two retailers, manufacturer products are not differentiated; however, we allow arbitrary product differentiation if there is only one retailer (see §3.1). In the case of single manufacturer and two retailers, we model retailer differentiation a la Hotelling with demand originating from a unit mass of consumers distributed on the $[0, 1]$ interval with density $\mu(x)$ and retailers located somewhere on the interval. A consumer at point $x \in [0, 1]$ receives utility $V - t|\ell - x|$ from the product offered by a retailer located at ℓ. We restrict $\mu(\cdot)$ to be symmetric around 1/2 and concave, and denote $\mu(1/2)$ by μ_0. Also, for simplicity, we let $\mu(\cdot)$ and V be high enough such that a monopoly retailer located at $x = 0$ will choose to sell to all consumers if the wholesale price is equal to marginal costs. We normalize the constant manufacturer marginal cost to zero but allow retailers to potentially have fixed and marginal costs of retailing.

We assume that if a channel member does not sign any contract, he has an outside option providing it with zero profit. In the case of one manufacturer and two retailers, the contract between the manufacturer and each retailer is assumed to be determined by the retailer bargaining parameter $\lambda \in [0, 1]$ (which can be retailer specific), where λ corresponds to the generalization of the Nash bargaining power applied to our model. Namely, λ is such that the retailer obtains a fraction λ of the contribution to the total profit that it brings to the channel (Iyer and Villas-Boas 2003). Specifically, let π_{all} be the total channel profit attainable when both retailers participate in the channel and, for a given retailer i, let π_{-i} be the total profit of the channel consisting of the manufacturer(s) and the other retailer $j \neq i$. Then, retailer i is said to have bargaining power $\lambda \in [0, 1]$ if it receives a profit of $\pi_i = \lambda(\pi_{all} - \pi_{-i})$. Note that λ might not depend on the retailer differentiation (t) or the consumer distribution ($\mu(\cdot)$), and therefore, this definition of bargaining power allows us to consider retailer bargaining power (but not the profit earned) as a variable independent of retailer competition.[7]

The above definition of retailer-manufacturer contract outcome spans the entire core of the (cooperative) game and, at extreme ends, corresponds to the following outcomes: If $\lambda = 1$, the contract corresponds to the case when the retailer(s) are giving take-it-or-leave-it offer(s) to the manufacturer(s), while $\lambda = 0$ corresponds to manufacturer(s) issuing take-it-or-leave-it offers to the retailer(s). In other words, these are the extreme cases representing the ability of either the retailer or the manufacturer to move first and offer a contract. Namely, $\lambda = 1$ corresponds to the case when the retailer has the maximal bargaining power given the demand and competitive conditions, and $\lambda = 0$ corresponds to the minimal retailer bargaining power possible given demand and competitive conditions.

The above definition relates bargaining power to the negotiation process or the characteristics of negotiators rather than to market factors such as competition, concentration, and size. Thus, retailer bargaining power should not be confused with retailer market

[7] Alternatively, Messinger and Narasimhan (1995) consider retailer and manufacturer power, which is defined as the relative profits and may not necessarily represent bargaining power.

power, which is a concept related to the degree of retail competition.

Because we are interested in the possibility of $T < 0$, the question arises as to what such a fee, paid by manufacturer to the retailer, requires the retailer to do. We assume that this fee can be made conditional on the retailer incurring (part of) the fixed selling cost but can not be made conditional on the retailer declining a contract from another manufacturer or the manufacturer not dealing with another retailer.[8] We also discuss the consequences of letting T be completely unconditional and show the possibility of slotting allowances even in that case.

3. Slotting Allowances: Retailer or Manufacturer Competition?

3.1. Monopoly Retailer

Assume one retailer and any number J of manufacturers. Denote the consumer demand for the product of manufacturer j by $D_j(p_1, \ldots, p_J)$, where $p_1, \ldots, p_J$ are the retail prices of the J products. As a special case, this specification allows two manufacturers differentiated along the Hotelling line segment. The following proposition demonstrates that in this case, one should not observe slotting allowances regardless of the functional form of the demand, cost, product differentiation, and manufacturer competition.

Proposition 1. *Using a two-part-tariff contract with wholesale price equal to the manufacturer's marginal cost is optimal for any manufacturer. Furthermore, if consumer demand for a manufacturer's product is downward sloping at any retail price, the manufacturer finds such a wholesale price strictly optimal and, in the equilibrium, never offers slotting allowances.*

The intuition for the above proposition is that a wholesale price higher than the manufacturer's wholesale price in the presence of a single retailer creates the problem of double marginalization, as such wholesale price does not provide the retailer with the right incentive to set the industry-optimal retail price. At the same time, it is appropriate to consider industry-optimal outcomes because the tariff can always be used to appropriately allocate the channel surplus. Note that this outcome does not depend on the number of manufacturers or the degree of competition between them due to the fact that offering a contract with wholesale price equal to marginal cost is individually optimal for each manufacturer.

[8] In other words, we do not allow explicitly exclusionary contracts. Note that while explicit or implicit exclusionary provisions are possible, they attract the undesirable attention of the Federal Trade Commission.

3.2. Monopoly Manufacturer, Symmetric Retailer Competition

Let us now consider one monopoly manufacturer and two retailers located at the opposite ends of the Hotelling line segment. Assume that the retailers have constant and equal marginal cost of retailing, and normalize it to zero. The retailers potentially each have a fixed cost $C \geq 0$ of selling the product, which at the moment we also consider to be identical for both retailers.

We further assume that the manufacturer is restricted to set the same wholesale price for both retailers.[9] Assume that if a retailer accepts the contract, it must incur the fixed cost C of selling the product (as a condition of the contract) regardless of the number of units it actually sells. We have the following proposition.

Proposition 2. *In the equilibrium of the above model, both retailers will sell the product if $C \leq t/2$, and only one retailer will sell the product if $C > t/2$. Slotting allowances will be observed if both retailers sell the product and $(1-\lambda)C + \lambda t/2 > t/(2\mu_0)$, and will not be observed if only one retailer sells the product or $(1-\lambda)C + \lambda t/2 < t/(4\mu_0)$.*

The intuition for the above proposition is that in the presence of retail competition, setting a wholesale price equal to the marginal cost could result in retail prices that are too low (relative to the industry optimal). Therefore, the wholesale price should be raised in order to force retail prices to rise to industry-optimal levels (see also Shaffer 1991). High wholesale prices open up a theoretical possibility of slotting allowances since the manufacturer now has some profit margin. When the manufacturer is a monopoly making take-it-or-leave-it offers to the retailers, the lump sum transfer T is set to exactly offset the high per-unit wholesale price and leave the retailers with zero profits and might be negative.

The result is not straightforward since the manufacturer has an option to sell through a single retailer rather than both. If many consumers consider the retailers to be so similar as to result in retail competition strong enough to not allow retailers to cover the fixed cost, then the manufacturer might be better off utilizing only one retailer. The above proposition states that when sufficiently many consumers are located in the middle of the Hotelling line, slotting allowances are possible. In other words, Proposition 2 demonstrates that distribution through both retailers

[9] This restriction is not important when the fixed transfer goes from the manufacturer to the retailer and, hence, for the possibility or magnitude of slotting allowances. At the same time, the restriction is consistent with the literature (see, for example, Lal and Villas-Boas 1998) and might be justified due to legal restrictions.

can be industry optimal even when the competitive retailer margins do not cover the retailer costs.

Note that if retail margins do not cover the per-unit fixed costs, the retailer's profit is less than the slotting allowance. This is consistent with industry observation that many competing retailers would have zero or negative profits if they did not receive slotting allowances, pay-to-stay fees, and/or lump sum trade promotions (see FTC 2003, Farris and Ailawadi 1992). To force the retailer to incur the fixed cost and sell the product, the manufacturer has to condition the slotting allowance on the retailer incurring part of the fixed cost large enough to make the remaining part not covered by margins. However, if retailer bargaining power λ is high enough, then slotting allowances may be offered even unconditionally. In particular, the manufacturer does not have to condition the slotting fee on anything if $C < t/\mu_0$. In that case, even though the retailer is not obliged to sell the product, he will choose to do so due to the desire for additional profits.

Substituting $\lambda = 0$ in the condition of the above proposition, we obtain the following corollary:

Corollary 1. *Slotting allowances may be used when the manufacturer is a monopoly and retailers have no bargaining power.*

One can understand μ_0, the density of the marginal consumers that are willing to switch when the price slightly changes, as a measure of competitiveness of the market. The connection between μ_0 and competitive level can also be seen by observing the equilibrium retailer price p given a wholesale price w: $p = w + t/\mu_0$. Hence, we have the following corollary.

Corollary 2. *Slotting allowances may be observed at a larger range of retailer fixed costs if retailer competition is stronger, and slotting allowances are more likely to be observed when fixed costs are larger.*

The following corollary underscores the importance of distinguishing bargaining and market power, where the first corresponds to a superior negotiation skill and the latter corresponds to a lack of competition.

Corollary 3. *With higher retailer bargaining power, both the incidence (the range of C under which slotting allowances are possible) and the size of slotting allowances increase. When bargaining power and retailer competition are high enough ($\lambda > 1/\mu_0$), slotting allowances are always observed in any equilibrium with two retailers.*

3.3. Manufacturer and Retailer Competition

In the previous subsections, we showed that manufacturer competition without retailer competition is not sufficient for slotting allowances to exist regardless of the cost structure or manufacturer differentiation, but retail competition (combined with either fixed costs or retailer bargaining power) leads to slotting allowances even when the manufacturer is a monopoly and retailers have minimal bargaining power. In order to consider the effect of manufacturer competition on slotting allowances in the presence of retailer competition, we now consider the case of two undifferentiated manufacturers, each selling one product, and two retailers differentiated as in the previous section.

Proposition 3. *In the equilibrium, each retailer sells at most one product. Both retailers may sell a product if and only if $C \le t/\mu_0$. If both retailers sell the product, they receive a slotting allowance of $A = \min\{C, t/2\mu_0\}$ and face wholesale price of $2A$.*

An implication of Proposition 3 is that manufacturer competition, in the presence of retail competition, may either increase or decrease distribution as well as either increase or decrease slotting allowances. On the other hand, when both retailers participate and have strictly positive fixed costs, the incidence of slotting allowances is always higher with manufacturer competition than without it.

4. Effects of the Retailer Advantage in Operating Efficiency or Location

In this section, we derive the model implications when one of the retailers has an operating efficiency (marginal operating cost) advantage (the technical appendix available online shows that the effects of location advantage are similar). In order to consider operating efficiency advantage, assume that the retailers located at 0 and 1 of the Hotelling line segment have fixed C_i and marginal c_i operating costs. Let $c_1 = c$ and, without loss of generality, assume that $c_2 \equiv c + \Delta c > c$ so that Retailer 1 has the advantage of lower marginal operating cost. We further consider the case of uniform distribution of consumers on $[0, 1]$. While we continue to assume that the manufacturer has to set the same wholesale price for both retailers, we allow tariffs to be different across retailers.[10] As discussed in the case of symmetric retailers, slotting allowances are conditional on incurring (a part of) the fixed costs. Furthermore, the manufacturer's willingness to compensate the retailer costs is constrained by the condition that it must be profitable for the manufacturer to keep both the retailers in business. To distinguish between the direct effect of cost efficiency on

[10] It has been argued that because slotting allowances are negotiated in secrecy, manufacturers are able to discriminate in the size of slotting allowances (Sullivan 1997, U.S. Congress 1999). Lump sum payments may be arranged less frequently than per-unit payments and might be more easily disguised as a part of other fees (such as promotional allowances, shelf cost compensation, etc.) and, therefore, might not be as easily observable as wholesale prices.

slotting allowances and the indirect effect through the bargaining power, we restrict the bargaining power parameter λ to be the same for both retailers. It turns out that Retailer 2 has a positive market share only if $\Delta c < 2t$. We therefore restrict the marginal cost parameters to satisfy this condition and obtain the following proposition (see the technical appendix online for the corresponding proposition when one of the retailers has an advantageous location).

Proposition 4. 1. *The slotting allowance for the low-marginal-cost Retailer* 1 *could be as large as* $(2t+\Delta c)^2/(16t)$, *whereas the slotting allowance for the high-marginal-cost Retailer* 2 *is at most* $(2t-\Delta c)^2/(16t)$.

2. *When retailer bargaining power is high enough* ($\lambda > 2t/(2t+\Delta c)$), *the retailer with the lower marginal cost has a slotting allowance, and it is higher than the possible slotting allowance of the other retailer no matter what the fixed costs are.*

3. *For all parameter values* $(\lambda, C_1, C_2, c_1, c_2)$, *the manufacturer can avoid* (*by choosing an appropriate wholesale price*) *slotting allowances to the retailer with higher marginal cost without sacrificing profits. However, the manufacturer cannot always avoid paying slotting allowances to the retailer with lower marginal costs.*

In other words, the above proposition states that both incidence and size of slotting allowances may be higher for the retailer with an operating cost advantage. Note that the actual size of the slotting allowances will depend on the retailer's fixed costs unless $\lambda = 1$.[11] The second part of the above proposition states that when retailer bargaining power is high enough, slotting allowances are expected to be negatively correlated with retailer marginal selling costs. To link slotting allowances with retailer size, note that the retailer with lower marginal costs or location advantage has a larger market share.

The following might help to see the intuition of why the retailer who already has an advantage might have a higher slotting allowance as well. While the (location or marginal cost) advantage results in higher competitive market share, the industry-optimal market share of the retailer with the advantage is even higher than the competitive one. Therefore, the retailer with the advantage does not capture all the channel benefit of this advantage from the competitive profits and, thus, the manufacturer may find it optimal to supplement such a retailer through a slotting allowance (which does not affect competition). One could expect that the larger retailer would have higher bargaining power. In fact, this assumption has been used as the rationale behind the suggestion that larger retailers should have higher slotting allowances. If size is indeed correlated with bargaining power, then the result in our model that larger retailers have higher slotting allowances will remain valid. But what we have shown is much stronger. Namely, we have shown that there is a connection between retailer size and slotting allowances even if the retailer's bargaining power is kept constant.

[11] One may suspect that retailers achieve operational or location advantage by incurring fixed cost.

5. Discussion and Implications for Empirical Research

Comparing model predictions when slotting allowances are allowed with model predictions when the manufacturer is restricted to use wholesale-price-only contracts, we have the following result (see the proof in the online technical appendix).

Proposition 5. *In the model of* §3.2, *slotting allowances* (*as opposed to wholesale-price-only contracts*) *may only have an effect of increasing retail distribution, bringing it to the industry-optimal level. If distribution is increased* (*which happens when* $C \in (t/2\mu_0, t/2)$), *social welfare increases if and only if* $C > t/4$. *If distribution does not increase, slotting allowances have no effect on social welfare.*

The above proposition implies that slotting allowances in our setting can be used to increase distribution (which may either increase or decrease social welfare) and are not used for exclusionary purposes. It is intriguing to apply the above results to the question of the optimality of government subsidies in competitive industries. For example, by labelling the government as a "manufacturer" with zero wholesale price and companies as "retailers" in the framework of our model, one could view government support for some firms in competitive markets (e.g., farmers or airlines) as ensuring an efficient number of producers when competitive margins under the socially efficient number of producers do not cover the fixed costs of each company.

Empirical research based on a theoretical model can proceed in two directions. First, one may wish to see whether the *assumptions* of the model fit reality; if they do, then the model predictions must logically follow. Second, one may try to test how the *predictions* of the model fit the observed reality. The assumptions that we have made about the market environment may be true in some markets but not in others. For example, we considered a one-shot interaction structure where slotting allowances are part of a two-part pricing tariff. Alternatively, negotiations may proceed in stages.

Our results suggest various sources of slotting allowances: retail competition, retail fixed costs, and bargaining power, as well as differences in retailer marginal operating costs and location advantage. Furthermore, the effects of these forces are interrelated.

For example, in our model, a retailer's fixed costs and bargaining power do not result in slotting allowances in the absence of retail competition (e.g., the Wal-Mart and Costco example). Similarly, retail competition does not result in slotting allowances without retail costs or bargaining power. Another implication is that retail bargaining power and fixed costs of selling a product may be complements in causing slotting allowances: If retail bargaining power is strong, fixed-cost variance does not affect slotting allowances as much, and vice versa. All the above predictions can potentially be empirically tested.[12]

Some empirically observed variables that one may be tempted to use to construct proxies for either retailer bargaining power or retailer competition are profits and retail concentration. Unfortunately, while profits might have a positive correlation with bargaining power, they may have a negative correlation with competition. A similar problem occurs with retail concentration: While higher concentration might indicate higher bargaining power, it could also indicate lower competition.[13] A possible solution for empirical research could be to estimate the level of competition through retailer demand cross-elasticity. For bargaining power, it might be appropriate to use data on the personality and type of the managers involved, their reputation, and the duration of interaction between the parties to construct a proxy for bargaining power in empirical research. The retailer ability to offer a private label might also affect retailer bargaining power (Pauwels and Srinivasan 2004).

Another example of two factors that might be difficult to empirically separate, and that have an opposite directional effect on slotting allowances, are low fixed costs and low marginal operating costs. If the data distinguishing between marginal and fixed costs are not available, one could potentially estimate the marginal costs through econometric methods.[14]

One observed variable that seems to have a clear effect on slotting allowances is the size of the retailer. Not surprisingly, this correlation has been observed in many studies.

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Appendix

Proof of Proposition 1. Let the equilibrium contract between manufacturer i with marginal cost c_i and the retailer be $S = (T_i, w_i)$. Let the equilibrium quantity sold and the retail price of product i be Q_i and p_i, respectively. Then, the contract $S_i = (T_i + (w_i - c_i)Q_i, c_i)$ is at least as good for both the manufacturer i and the retailer: The manufacturer is guaranteed the same level of profit no matter what the retailer does, and the retailer has an option of buying the same amount Q_i for the same payment to the manufacturer as it chose before. Furthermore, if in the equilibrium with the above contract S the retailer sells product i and faces strictly downward sloping consumer demand at p_i, the contract $S_2 = (T_i + (w_i - c_i)Q_i + \varepsilon, c_i)$ will be strictly preferred to the contract S for some $\varepsilon > 0$ by both the manufacturer i and the retailer. This is because, first, S_2 provides the manufacturer ε higher profit than the contract S. Second, if $w_i > c_i$, the optimal retailer purchase quantity under the new contract is $Q_i' > Q_i$ and the retailer is strictly better off if ε is small enough; and, if $w_i < c_i$, the optimal retailer purchase quantity is $Q_i' < Q_i$ and also leads to strictly higher retailer profits when ϵ is small enough.

Hence, for any equilibrium contract, we can find a contract with wholesale price equal to the marginal cost that is at least as good the equilibrium one. Furthermore, it has to be the equilibrium contract if the consumer demand at any price is downward sloping. When the wholesale price is equal to marginal costs, the transfer from retailer to manufacturer has to be nonnegative (i.e., no slotting allowances). The proposition is proven, and the above proof does not rely on any specific demand or product substitutability conditions.

Proof of Proposition 2. The manufacturer's problem reduces to finding the wholesale price that maximizes channel profits and to setting the tariff so that the retailers achieve the required profit. Given a sufficiently high V, when both and one retailer participates, respectively, the channel-optimal retail prices are $p = V - t/2$ and $p = V - t$, resulting in the total channel profit $V - t/2 - 2C$ and $V - t - C$. Therefore, two retailers are optimal for the channel if and only if $C \leq t/2$. First-order conditions on the

[12] Empirical research into slotting allowances has been mostly restricted to analyzing surveys due to the difficulty of obtaining reliable data. Bloom et al. (2000) and Wilkie et al. (2002) find that slotting allowances increase with retail size and power and do not find support for the signaling rationale. Rao and Mahi (2003) also find support for retail power but not signaling rationale. On the other hand, Sullivan (1997), analyzing a time series of aggregate market level data, finds no support that retailer market power causes slotting allowances. Recently, Sudhir and Rao (2006), in a study of a large number of new product offers to a single although large retailer, find no support for retail power effect on the fees, but present evidence that slotting allowances can be used for manufacturer signaling, to widen retail distribution, and to mitigate retail competition (Bloom et al. 2000 and Wilkie et al. 2002 also suggest that slotting allowances increase retail price).

[13] This may explain Sullivan's (1997) failure to find a positive effect of the retailer's bargaining power on slotting allowances when the proxy for bargaining power is retail concentration.

[14] For example, Rao and Mahi (2003) view as counterintuitive their empirical finding that the retailers with lower operating costs receive slotting allowances more often; however, in view of the discussion above, this finding becomes intuitive if retail managers understood "operating costs" as the marginal costs of selling the products.

optimality of the retail price $p = V - t/2$ when both retailers participate imply that wholesale price w must satisfy

$$\begin{cases} \dfrac{1}{2t}\mu_0(p-w) \le \dfrac{1}{2}, \\ \dfrac{1}{t}\mu_0(p-w) \ge \dfrac{1}{2}. \end{cases} \tag{1}$$

Therefore, the optimal wholesale price is in the range $[V - t/2 - t/\mu_0, V - t/2 - t/(2\mu_0)]$. This range of multiple wholesale prices arises because the manufacturer can set the wholesale price so that the retailers cover the market but are local monopolists or can set the wholesale price so that the retailers compete in a meaningful way.

Given the wholesale price in the range above, the tariff must be $T = (V - t/2 - w)/2 - C - \lambda(t/2 - C)$, where the term $t/2 - C$ is each retailer's contribution to the channel profit. Therefore, $T \in [t/(4\mu_0) - C - \lambda(t/2 - C), t/(2\mu_0) - C - \lambda(t/2 - C)]$. Hence, when two retailers are participating, if $(1-\lambda)C + \lambda t/2 > t/(2\mu_0)$, then the tariff is negative (i.e., a slotting allowance) for any optimal wholesale price w, and if $(1-\lambda)C + \lambda t/2 < t/(4\mu_0)$ then the tariff is positive for any optimal wholesale price w.

It remains to note that, in equilibrium, two retailers are participating if $C < t/2$ and only one does if $C > t/2$, because the manufacturer can ensure a single participating retailer when it is optimal by offering contract with wholesale price $w = 0$ and appropriate tariff.

Proof of Proposition 3. Because the manufacturer products are not differentiated, in the equilibrium, manufacturers have zero profits; and retailers, in the presence of fixed costs, sell at most one product each. Therefore, the contracts must have the form $(-w * \mathrm{E}(\text{market share} \mid w), w)$, i.e., in a symmetric equilibrium $(-w/2, w)$. Also, slotting allowances cannot exceed retailer fixed cost, because if they did, retailers would take both contracts but sell only one with lower wholesale price.

Hence, for the possibility of equilibrium with two retailers selling a product, we are looking for w such that manufacturers do not want to deviate from both offering contract $(-w/2, w)$. It is easy to see that given contract $(-w/2, w)$, retailers set prices $p = w + t/\mu_0$ and earn gross profit margin $t/2\mu_0$. Consider now a manufacturer deviating by offering a contract with w lower by δ, where δ is small (due to concavity of profit functions, it is sufficient to consider small deviations). If Retailer 1 would accept the deviating contract, the first-order conditions on the retailer profit maximization imply that the resulting retail prices would be $p_1 = w + t/\mu_0 + 2\delta/3$ and $p_2 = w + t/\mu_0 + \delta/3$, and market shares would be $ms_1 = 1/2 - \delta\mu_0/(6t)$ and $ms_2 = 1/2 + \delta\mu_0/(6t)$, resulting in gross profit margins $(3t - \delta\mu_0)^2/(18t)$ and $(3t + \delta\mu_0)^2/(18t)$. Also, the deviating manufacturer can offer slotting allowance to Retailer 1 in the amount up to $ms_1(w+\delta) = (3t - \mu_0\delta)(w-\delta)/(6t)$. Therefore, the total profit of Retailer 1 increases by $(3t - 2\mu_0\delta - 3\mu_0 w)\delta/(18t)$, deviation with small positive δ is profitable if $w < t/\mu_0$, and deviation with small negative δ is profitable if $w > t/\mu_0$ (profit of Retailer 2 if it were to accept the deviating contract versus accepting the nondeviating one would increase by a smaller amount, and, therefore, if one retailer wants to accept, there is always a value of slotting allowance making only one retailer wanting to accept and leaving the deviating manufacturer with higher profit). We also have that the positive deviation is constrained by slotting allowance not to exceed C, i.e., $w \le 2C$. Hence, the equilibrium wholesale price is $\min\{2C, t/\mu_0\}$.

Given the equilibrium wholesale price when two retailers are participating, we have that each retailer has total profits of $\min\{2C, t/\mu_0\}/2 + t/2\mu_0$ and, therefore, has nonnegative profits if and only if $C \le t/\mu_0$. Hence, an equilibrium with two participating retailers exists if and only if $C \le t/\mu_0$, and the proof is complete.

Proof of Proposition 4 (Part 1). As in the proof of Proposition 3, the manufacturer needs to set wholesale prices so that the channel profits are maximized, and then to set transfers so as to give the retailers their required profit. We will show that the manufacturer can achieve (industry-optimal) channel coordination, and that the optimal two-part tariffs may involve slotting allowances in the maximal amounts stated in the proposition.

The maximal total channel profit of the fully integrated channel is achieved by maximizing $x(p_1 - c) + (1-x) \cdot (p_2 - c - \Delta c)$ over $x \in [0,1]$, where $p_1 = V - tx$ and $p_2 = V - t(1-x)$ are the retail prices and x is the location of the indifferent consumer. Therefore, the total channel profit is maximal at $x = 1/2 + \Delta c/(4t)$, implying that both retailers have positive market share when $\Delta c \le 2t$. The channel optimal prices are $p_1^* = V - (1/4)\Delta c - (1/2)t$ and $p_2^* = V + (1/4)\Delta c - (1/2)t$ and channel profit is $\Pi_c = \Delta c^2/(8t) - (1/2)(-2v + 2c + t + \Delta c) - C_1 - C_2$, where C_i is the fixed cost of Retailer $i = 1, 2$.

Similarly to Equation (1), we derive that the above channel profit optimizing retail price p_i^* is individually optimal for retailer i if

$$\begin{cases} ms_i \ge \dfrac{1}{2t}(p_i^* - w - c_i), \\ ms_i \le \dfrac{1}{t}(p_i^* - w - c_i), \end{cases} \tag{2}$$

where ms_i is the market share of the retailer i. Hence, w that makes the retail prices p_1^* and p_2^* optimal for the corresponding retailer satisfies $V - c - \Delta c/2 - t \ge w \ge V - c - 3\Delta c/4 - (3/2)t$ and $V - c - \Delta c/2 - t \ge w \ge V - c - \Delta c/4 - (3/2)t$. Therefore,

$$V - c - \frac{\Delta c}{2} - t \ge w \ge V - c - \frac{\Delta c}{4} - \frac{3}{2}t. \tag{3}$$

Retailer profits in the equilibrium are given by

$$\begin{aligned} \Pi_1 &= -\frac{1}{16}(2t + \Delta c)\frac{2t + 4c + \Delta c - 4V + 4w}{t}, \\ \Pi_2 &= -\frac{1}{16}(2t - \Delta c)\frac{2t + 4c + 3\Delta c - 4V + 4w}{t}. \end{aligned} \tag{4}$$

When Retailer 2 is the only one selling, channel profits are $V - t - c - \Delta c - C_2$ and the contribution of Retailer 1 to the total channel profit is $Cont_1 = \Pi_c - (V - t - c - \Delta c - C_2) = (1/(8t))(2t + \Delta c)^2 - C_1$. Similarly, Retailer 2's contribution is

$Cont_2 = (1/(8t))(2t-\Delta c)^2 - C_2$. The values of transfers to the manufacturer are given by $T_i(\lambda) = \Pi_i - C_i - \lambda(Cont_i)$:

$$\begin{aligned} T_1(\lambda) &= -\frac{1}{16}(2t+\Delta c)\frac{2t+4c+\Delta c-4V+4w+4\lambda t+2\lambda\Delta c}{t} \\ &\quad -(1-\lambda)C_1, \\ T_2(\lambda) &= -\frac{1}{16}(2t-\Delta c)\frac{2t+4c+3\Delta c-4V+4w+4\lambda t-2\lambda\Delta c}{t} \\ &\quad -(1-\lambda)C_2. \end{aligned} \tag{5}$$

In order to find the maximal slotting allowance we need to minimize the above expressions. If we substitute the highest possible wholesale price (Equation 3) into Equation (5), we find that the highest potential slotting allowances the retailers might get are $-T_1^{\min} = (1/16)(2t+\Delta c)^2/t$ and $-T_2^{\min} = (1/16)(2t-\Delta c)^2/t$.

Proof of Proposition 4 (Part 2). We want to find conditions under which $T_1 < T_2$ for all values of fixed costs such that both retailers are in the market. We have

$$\begin{aligned} T_1(\lambda) - T_2(\lambda) &= -\frac{1}{4}\Delta c\frac{4\lambda t + 2c + \Delta c - 2V + 2w}{t} \\ &\quad - (1-\lambda)(C_1 - C_2) \end{aligned} \tag{6}$$

Recall that $C_1 \geq 0$, $w \geq V - c - \Delta c/4 - (3/2)t$, and $C_2 \leq (1/(8t))(2t-\Delta c)^2$. Hence,

$$\max(T_1(\lambda) - T_2(\lambda)) = -\frac{1}{8}(2t+\Delta c)\frac{-2t+2\lambda t+\lambda\Delta c}{t}, \tag{7}$$

which is negative as long as $\lambda > 2t/(2t+\Delta c)$. It remains to verify that for $\lambda > 2t/(2t+\Delta c)$, Retailer 1 will indeed get a slotting allowance, i.e., $T_1 < 0$. We have that $T_1(\lambda)$ is a decreasing function of λ. Therefore, for $\lambda > 2t/(2t+\Delta c)$, we have $T_1(\lambda) < (-1/16)(2t+\Delta c)(4w-4V+4c+\Delta c+6t)/t - (1-\lambda)C_1$, which is negative for all wholesale prices allowed by Equation (3).

Proof of Proposition 4 (Part 3). By choosing the lowest w that sustains optimal profits, the manufacturer sets $\min(T_2(\lambda)) \geq (1/8)(1-\lambda)(2t-\Delta c)^2/t - (1-\lambda)C_2$. Because C_2 cannot exceed Retailer 2's contribution to the channel, we have $C_2 \leq (1/(8t))(2t-\Delta c)^2$, and therefore, $T_2(\lambda) \geq 0$. Hence, there always exists a wholesale price w such that Retailer 2 will not get a slotting allowance.

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