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## Consumer shopping costs as a cause of slotting fees: A rent-shifting mechanism

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Stéphane Caprice • Vanessa von Schlippenbach

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# Consumer Shopping Costs as a Cause of Slotting Fees: A Rent-Shifting Mechanism

Stéphane Caprice \*      Vanessa von Schlippenbach †‡

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## Abstract

Analyzing a sequential bargaining framework with one retailer and two suppliers of substitutable goods, we show that slotting fees may emerge as a result of a rent-shifting mechanism when consumer shopping costs are taken into account. If consumers economize on their shopping costs by bundling their purchases, their buying decision depends rather on the price for the whole shopping basket than on individual product prices. This induces complementarities between the goods offered at a retail outlet. If the complementarity effect resulting from shopping costs dominates the original substitution effect, the wholesale price negotiated with the first supplier is upward distorted in order to shift rent from the second supplier. As long as the first supplier has only little bargaining power, she compensates the retailer for the upward distorted wholesale price by paying a slotting fee. We also show that banning slotting fees causes per-unit price to fall and welfare to increase.

*JEL-Classification: L22, L42*

*Keywords: Shopping costs, rent-shifting, slotting fees*

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# 1 Introduction

In the grocery industry it has become a widespread practice that retailers charge slotting fees to their suppliers. Basically, manufacturers have to pay a fee to get their products placed in the retailers' store shelves. These payments are made for both the initial access to the retailers' shelves in the case of new products as well as the continuing access in the case of already established products. In addition, retailers demand for a wide number of add-on fees such as promotional, advertising and stocking allowances. These fees differ greatly with respect to the product, manufacturer, and market conditions. The average amount of (so-called) slotting fees per item, per retailer and per metropolitan area ranges from \$2,313 to \$21,768 (FTC 2003). Moreover, slotting fees vary widely within product categories. The importance of slotting allowances in the relationship between retailers and manufacturers has dramatically increased since the late 1980ies. At the same time, the retail industry, particularly in Europe, has gone through a profound consolidation process that has limited the suppliers' trading alternatives (EC 1999, OFT 1998). Thus, goods have to pass through "the decision-making screen of a single dominant retailer" to be distributed to final consumers (FTC 2001). In particular, small manufacturers often complain that they are more likely to pay slotting fees than large manufacturers (FTC 2001, 2003).<sup>1</sup> However, the retailer's bargaining power does not suffice to explain the emergence of slotting fees in supplier-retailer relationships, as large retailers like Wal-Mart and Costco with tremendous bargaining power vis-à-vis their suppliers never charge slotting fees (FTC 2001).

The grocery industry is also characterized by the increasing preference of consumers to bundle their purchases to economize on their shopping costs. That is, consumers prefer to concentrate purchases with a single retailer avoiding additional shopping costs when using additional retailers. In the UK, about 70% of consumers practice such a so-called one-stop shopping behavior in spending about 80% of their weekly expenditures for fast moving consumer goods on a weekly main trip (UK Competition Commission 2000). If consumers bundle their purchases, their buying decision depends on the price for the whole shopping basket rather than on individual product prices. This induces positive

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<sup>1</sup>For example, the investigation of the Heinz-Beechnut "baby-food" merger has shown that the market leader for babyfood does not pay slotting fees to retailers, while the smaller competitors do (Innes and Hamilton 2006).

demand externalities, i.e. complementarity between the products offered at a retail outlet.<sup>2</sup>

Our paper provides a new explanation for the emergence of slotting fees in supplier-retailer relationships by explicitly taking into account consumer shopping costs.<sup>3</sup> Referring to positive demand externalities due to shopping costs, we show that slotting fees may emerge as a result of a rent-shifting mechanism in a three-party negotiation framework with complete information. We depart from the literature demonstrating that slotting fees are introduced for signaling or screening purposes (Kelly 1992, Chu 1992, DeVuyt 2005 and Sullivan 1997).<sup>4</sup>

We consider a monopolistic retailer that negotiates sequentially with two suppliers of substitutable products. In a similar framework Marx and Shaffer (1999) show that below-cost pricing in intermediate good markets can arise as it allows the retailer and the first supplier to extract rents from the second supplier. This is due to the fact that the retailer's disagreement payoff with the second supplier is decreasing in the price at which she can buy additional units from the first supplier. Accordingly, downward distortion of the wholesale price with the first supplier improves the retailer's disagreement payoff in the second negotiation and, thus, allows the first supplier and the retailer to extract rents from the second supplier. Taking consumer shopping costs explicitly into account, we show that the wholesale price negotiated with the first supplier can also be upward distorted. Upward distortion occurs if the positive demand externalities resulting from consumer shopping costs outweigh the original substitution effect. In this case, a higher wholesale price for the first good does not only reduce the demand for that good, it also lowers the demand for the second good. This, in turn, diminishes the incremental contribution of the second supplier to the joint profit with the retailer. Hence, the retailer's bargaining position in the second negotiation improves which enables the first supplier and the retailer to extract rents from the second supplier. However, the upward distorted wholesale price makes the first supplier the residual claimant of the rent shifted from the second supplier. To share the rent with the retailer, the first supplier pays a fixed fee to the retailer as long as her bargaining power is sufficiently low. Thus, slotting fees

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<sup>2</sup>For an early account of consumer shopping behavior and the related positive demand externalities, see Stahl (1982 and 1987) and Beggs (1994).

<sup>3</sup>Following Shaffer (1991), we define slotting allowances as a negative fixed transfer in a two-part tariff contract between a manufacturer and a retailer.

<sup>4</sup>In a similar vein (sharing risk explanation), see Nocke and Thanassoulis (2010).

may emerge in a sequential bargaining framework when consumers bundle their purchases to economize on their shopping costs. A ban of slotting fees would disable the first supplier to compensate the retailer for a higher wholesale price. Thus, a ban of slotting fees would reduce the extent of upward distortion in the first negotiation leading to a higher social welfare.

We further aim at explaining why some suppliers pay slotting fees, while their competitors do not. For this purpose, we endogenize the order of negotiation. Considering different degrees of exogenously given bargaining power for the suppliers, we show that the retailer prefers to negotiate first with the weaker supplier in order to improve her bargaining position vis-à-vis the stronger supplier. Since slotting fees are only paid by the first supplier, suppliers with little bargaining power are more likely to pay slotting fees than market or brand leaders. Moreover, we find that powerful retailers do not charge slotting fees. These retailers already capture a large share of the overall industry profit such that their incentive to distort wholesale prices for strategic purposes is relatively low. This is consistent with the observation that the largest and most powerful retailers like Wal-Mart or Costco never charge slotting fees to their suppliers (FTC 2001).

Our paper contributes to the literature on slotting fees based on the strategic use of contracts in vertically related industries.<sup>5</sup> Shaffer (1991) shows that slotting fees can constitute a facilitating mechanism for softening competition in downstream markets. In the context of multi-product markets, Innes and Hamilton (2006) demonstrate how a monopolistic supplier and competitive retailers can use slotting fees to obtain vertically integrated monopoly profits. Moreover, Miklos-Thal et al. (2009) and Bedre (2008) find that slotting fees constitute a means to internalize intrabrand contracting externalities. Slotting fees can also be used in order to exclude competitors at both the upstream (Shaffer 2005) and the downstream level (Marx and Shaffer 2007b). In this literature, the emergence of slotting fees mainly refers to the presence of retail competition.<sup>6</sup> Marx and Shaffer (2009) depart from this literature by showing that slotting fees may allow the retailer to capture more efficiently the value of her shelf space when shelf space is scarce without taking into account downstream competition. In our

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<sup>5</sup>This literature on the strategic use of contracts in vertically related markets is based on the seminal papers of Bonnano and Vickers (1988) as well as Rey and Stiglitz (1988). For more details, see Caillaud and Rey (1995).

<sup>6</sup>See also, Foros and Kind (2008) and Kuksov and Pazgal (2007).

paper the emergence of slotting fees does also not depend on retail competition.

The remainder of the paper is organized as follows: In Section 2, we specify our model taking into account consumer shopping behavior. We then analyze subgame perfect equilibria of the game in Section 3. Welfare implications are discussed in Section 4. Section 5 extends our basic framework to endogenize the order of negotiations. Finally, we summarize our results and conclude.

## 2 Model

Consider a vertical structure with two upstream firms  $U_i$ ,  $i = 1, 2$ , and a downstream firm  $D$ . Each upstream firm produces a single good. Goods are imperfect substitutes, whereas  $U_1$  produces good 1 and  $U_2$  produces good 2. The upstream firms sell their goods to the downstream retailer for subsequent distribution to final consumers. While the upstream firms bear positive constant marginal costs of production, i.e.  $0 < c < 1$ , the downstream firm's marginal costs of distribution are normalized to zero. All firms incur zero fixed costs.

**Negotiations.** We assume that the downstream firm negotiates sequentially with her suppliers about a two-part supply tariff  $T_i(w_i, F_i)$ , which entails a linear wholesale price  $w_i$  and a fixed fee  $F_i$ . Thus, the retailer negotiates first with supplier  $U_1$  and then enters into negotiations with supplier  $U_2$ . Each retailer-supplier pair aims at maximizing its respective joint profit when determining the wholesale price.<sup>7</sup> The surplus is divided such that each party gets her disagreement payoff plus a share of the incremental gains from trade, with proportion  $\delta_i \in [0, 1]$  going to the supplier and with proportion  $1 - \delta_i$  going to the retailer. In the case of  $\delta_i = 0$  the retailer makes take-it or leave-it offers to the suppliers  $U_i$ , while the opposite occurs if  $\delta_i = 1$ .

**Demand.** In modelling consumer behavior, we follow the approach by Stahl (1982). Consumers are uniformly distributed with density one along a line of infinite length. Consumer's location is denoted by  $\theta \in [-\infty, \infty]$ . In addition to goods 1 and 2, the economy involves a numeraire good 0. While the numeraire is available everywhere along the line, both consumer goods have to be purchased at the retail store which is located at  $\theta^D$ . Without loss of generality we assume

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<sup>7</sup>For a non-cooperative foundation of the generalized Nash bargaining solution, see Binmore et al. (1986).



$\theta^D = 0$ . Consumers incur transportation cost  $t$  per unit distance. A consumer, thus, bears shopping costs of  $\theta t$  when shopping at the retailer. Consumers are identical in income  $I$  and preferences, their gross utility is given by

$$U(x_0, x_1, x_2) = x_0 + u(x_1, x_2) = x_0 + \sum_{i=1}^2 x_i \left(1 - \frac{x_i}{2}\right) - \sigma x_1 x_2, \quad (1)$$

where  $\sigma \in [0, 1)$  indicates the degree of substitutability between goods 1 and 2. In the case of  $\sigma = 0$  goods are independent, while goods are substitutes for  $\sigma > 0$ . The more  $\sigma$  approaches 1 the more the products are substitutable. The utility function is separable in the numeraire  $x_0$ .<sup>8</sup>

Given that both goods are distributed by the retailer at prices  $p_i, i = 1, 2$  and the price for the numeraire is normalized to one, the utility-maximizing demand of a consumer located at  $\theta$  refers to<sup>9</sup>

$$\begin{aligned} \tilde{x}_0(p_1, p_2, \theta), \tilde{x}_1(p_1, p_2), \tilde{x}_2(p_1, p_2) &= \arg \max_{x_0, x_1, x_2} U(x_0, x_1, x_2) \quad (2) \\ \text{s.t. } x_0 + p_1 x_1 + p_2 x_2 + |\theta| t &\leq I. \end{aligned}$$

Consumers refrain from shopping at the retailer if their utility from local consumption and thus from purchasing only the numeraire exceeds their maximal utility from buying at the retailer, i.e.

$$U(I, 0, 0) = I \geq U(\tilde{x}_0(p_1, p_2, \theta), \tilde{x}_1(p_1, p_2), \tilde{x}_2(p_1, p_2)). \quad (3)$$

Accordingly, the set of consumers who are indifferent whether to buy at the retailer or not is given by

$$\{\theta | U(\tilde{x}_0(p_1, p_2, \theta), \tilde{x}_1(p_1, p_2), \tilde{x}_2(p_1, p_2)) = I\}. \quad (4)$$

Combining (2) and (4), good  $i$ 's overall demand in the market is given by

$$\tilde{X}_i(p_i, p_j) = 2\tilde{x}_i(p_i, p_j)\tilde{\theta}(p_i, p_j), \quad (5)$$

$$\begin{aligned} \text{with: } \tilde{x}_i(p_i, p_j) &= \frac{1}{1 + \sigma} - \frac{1}{1 - \sigma^2} p_i + \frac{\sigma}{1 - \sigma^2} p_j, \\ \tilde{\theta}(p_i, p_j) &= \frac{2(1 - \sigma)(1 - p_i - p_j) + p_i^2 + p_j^2 - 2\sigma p_i p_j}{2t(1 - \sigma^2)}. \end{aligned}$$

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<sup>8</sup>This assumption allows us to get computable results. Consumptions in goods 1 and 2 of a consumer located at  $\theta$  do not depend on the distance  $\theta$  from the retailer as long as consumptions are positive.

<sup>9</sup>To simplify notations, some arguments are omitted in the demand functions.

Demand functions are continuous in all variables. Differentiating (5) with respect to  $p_j$ , we obtain

$$\frac{\partial \tilde{X}_i(p_i, p_j)}{\partial p_j} = 2\tilde{\theta}(p_i, p_j) \underbrace{\frac{\partial \tilde{x}_i(p_i, p_j)}{\partial p_j}}_{>0} + 2\tilde{x}_i(p_i, p_j) \underbrace{\frac{\partial \tilde{\theta}(p_i, p_j)}{\partial p_j}}_{<0} \quad (6)$$

if  $\tilde{x}_i(p_i, p_j) > 0$  with  $i = 1, 2, i \neq j$ .

Obviously,  $\partial \tilde{x}_i(p_i, p_j)/\partial p_j$  indicates the standard substitution effect. It determines how the individual consumer's demand for good  $i$  is affected by the price  $p_j$ . As both goods are imperfect substitutes, this effect is strictly positive. However,  $\partial \tilde{\theta}(p_1, p_2)/\partial p_j$  quantifies the impact of price  $p_j$  on the size of the market, i.e. on the mass of consumers buying at the retailer. The latter effect is negative as consumers bundle their purchases of both goods to economize on their shopping costs. That is, a higher price for good  $j$  induces a higher price for the whole shopping basket such that less consumers are willing to buy at the retailer. Thus, complementarity arises between goods 1 and 2 as a higher price for one product reduces not only the demand for this respective product but also the demand for the other product offered by the retailer. Note that the complementarity effect occurs although goods are substitutable from a consumption point of view.<sup>10</sup> Due to these two countervailing effects, i.e. complementarity and substitution at the same time, overall demand for good  $i$  reacts ambiguously to an increasing price of good  $j$ .

Let us now consider the case, where the retailer only offers good  $i$ . Consumer utility from consumption then refers to

$$U(x_0, x_i, 0) = x_0 + x_i - \frac{1}{2}x_i^2, \quad \forall i = 1, 2 \quad (7)$$

yielding the utility-maximizing demands

$$\tilde{x}_0(p_i, \infty, \theta), \quad \tilde{x}_i(p_i, \infty) = \arg \max_{x_0, x_i} U(x_0, x_i, 0) \quad (8)$$

$$\text{s.t. } x_0 + p_i x_i + |\theta| t \leq I.$$

The set of consumers who are indifferent between visiting the retail store or staying with local consumption of the numeraire is then given by

$$\{\theta | U(\tilde{x}_0(p_i, \infty, \theta), \tilde{x}_i(p_i, \infty), 0) = I\}. \quad (9)$$

<sup>10</sup>For more details, see Stahl (1987).

The overall market demand, then, refers to

$$\tilde{X}_i(p_i, \infty) = 2\tilde{x}_i(p_i, \infty)\tilde{\theta}(p_i, \infty) \quad (10)$$

where

$$\begin{aligned} \tilde{x}_i(p_i, \infty) &= 1 - p_i, \\ \tilde{\theta}(p_i, \infty) &= \frac{(1 - p_i)^2}{2t}. \end{aligned}$$

**Profits.** Using the respective demand function as well as the properties of the bargaining process in the intermediate goods market, we specify the profit functions of the downstream retailer and the upstream suppliers as

$$\pi_{1,2}^D = \tilde{R}(p_1, p_2) - \sum_{i=1}^2 F_i, \quad i \neq j, \quad i = 1, 2 \quad (11)$$

$$\text{with} \quad : \quad \tilde{R}(p_1, p_2) = \sum_{i=1}^2 (p_i - w_i) \tilde{X}_i(p_1, p_2)$$

and

$$\pi_{1,2}^{U_i} = (w_i - c) \tilde{X}_i(p_1, p_2) + F_i, \quad \text{with } i = 1, 2, i \neq j, \quad (12)$$

respectively. Summarizing, we solve the following three-stage game: In the first stage, the retailer negotiates with supplier  $U_1$  about a two-part delivery contract. Negotiation with supplier  $U_2$  takes place in the second stage. Finally, the retailer sets prices and consumers make their purchase decision. We proceed by backward induction where our solution concept corresponds to subgame perfection.

### 3 Equilibrium analysis

By working backwards, we solve for the equilibrium strategies of the downstream retailer and the upstream suppliers taking the order of negotiation as given. We relax this assumption in Section 5.

**Stage 3 - Downstream Prices.** Taking the contracts with each supplier as given, the retailer sets the prices for both goods in the last stage of the game. Maximizing (11) with respect to  $p_1$  and  $p_2$ , we obtain the equilibrium downstream prices  $p_1^*(w_1, w_2)$  and  $p_2^*(w_1, w_2)$ .<sup>11</sup> We denote the equilibrium utility

<sup>11</sup>Due to the symmetry of linear demands resulting from  $u(x_1, x_2)$  and the separability of the utility function in the numeraire, i.e.  $U(x_0, x_1, x_2) = x_0 + u(x_1, x_2)$ , we get a simple expression for  $p_i^*(w_i, w_j)$  and  $p_i^*(w_i, \infty)$ , i.e.  $p_i^*(w_i, w_j) = p_i^*(w_i, \infty) = \frac{1}{4}(1 + 3w_i)$ .

maximizing demand, i.e.  $\tilde{x}_i(p_1^*, p_2^*)$ , as well as the overall equilibrium demand, i.e.  $\tilde{X}_i(p_1^*, p_2^*)$ , as  $x_i(w_1, w_2)$  and  $X_i(w_1, w_2)$ , respectively. The same holds for  $\tilde{\theta}(p_1^*, p_2^*)$  and  $\tilde{R}(p_1^*, p_2^*)$  that we denote as  $\theta(w_1, w_2)$  and  $R(w_1, w_2)$ . For later reference note that  $\partial X_i(w_i, c)/\partial w_i < 0$ . The reduced profit functions of the downstream and the upstream firms are, thus, given by

$$\pi_{1,2}^{D*} = R(w_1, w_2) - \sum_{i=1}^2 F_i \quad (13)$$

$$\pi_{1,2}^{U_i*} = (w_i - c) X_i(w_1, w_2) + F_i, \quad (14)$$

if the retailer sells both products to final consumers. If, however, only the upstream firm  $U_1$  supplies the retailer, we denote the reduced profit functions as

$$\pi_{1,0}^{D*} = R(w_1, \infty) - F_1 \quad (15)$$

$$\pi_{1,0}^{U_1*} = (w_1 - c) X_1(w_1, \infty) + F_1, \quad (16)$$

while the upstream firm  $U_2$  makes zero profit, i.e.  $\pi_{1,0}^{U_2*} = 0$ . Analogously, if the retailer fails to achieve an agreement with supplier  $U_1$ , the respective reduced profit functions are given by

$$\pi_{0,2}^{D*} = R(\infty, w_2) - F_2 \quad (17)$$

$$\pi_{0,2}^{U_1*} = 0, \quad \pi_{0,2}^{U_2*} = (w_2 - c) X_2(\infty, w_2) + F_2. \quad (18)$$

**Stage 2 - Negotiation with the second supplier.** In the second stage of the game the downstream firm negotiates with the second supplier  $U_2$  about a two-part tariff  $T_2(w_2, F_2)$ . The firms take the contract  $T_1(w_1, F_1)$  with the first supplier  $U_1$  as given when they determine  $T_2(w_2, F_2)$ . Using the reduced profit functions, the equilibrium bargaining outcome of the retailer and the second supplier can be characterized by the solution of

$$\max_{w_2, F_2} \left( \pi_{1,2}^{U_2*} \right)^{\delta_2} \left( \pi_{1,2}^{D*} - \pi_{1,0}^{D*} \right)^{1-\delta_2}. \quad (19)$$

The supplier's disagreement payoff equals zero as the suppliers do not have any alternative to get their goods distributed if they fail to achieve an agreement with the retailer. In the case of negotiation break-down with one supplier, the retailer may still sell the competitor's good. Solving (19) for the equilibrium wholesale price  $\hat{w}_2$  and the equilibrium fixed fee  $\hat{F}_2$ , we obtain:

**Lemma 1** *If the gains from trade between the retailer and the second supplier  $U_2$  are positive, there exists a unique equilibrium with*

$$\widehat{w}_2 = c \text{ and } \widehat{F}_2(w_1) = \delta_2 (R(w_1, c) - R(w_1, \infty)).$$

**Proof.** See Appendix. ■

As the negotiation outcome between the retailer and the second supplier does not affect the contract chosen in the first stage, they have no incentive to distort the wholesale price in the second stage. The equilibrium wholesale price, therefore, equals marginal cost and maximizes the joint profit of the retailer and the second supplier. This makes the retailer the residual claimant to the joint profit. As to share the joint profit the retailer pays a lump-sum fee  $\widehat{F}_2(w_1)$  to the supplier  $U_2$ . This payment corresponds to the supplier's incremental contribution to the joint profit weighted according to her bargaining power.

Considering that the retailer and the first supplier fail to achieve an agreement in the first stage of the game, the retailer's outside option when negotiating with the second supplier refers to zero. In this out-of-equilibrium event, the negotiated wholesale price is still equal to the marginal cost, while the fixed fee  $F_2$  refers to  $\widehat{F}_2(\infty) = \delta_2 R(\infty, c)$ . Then, the second supplier gets a payoff of  $\delta_2 R(\infty, c)$ , and the retailer earns  $(1 - \delta_2) R(\infty, c)$ .

**Stage 1 - Negotiation with the first supplier.** Anticipating the equilibrium strategies in stages two and three, the retailer and the first supplier negotiate about a two-part delivery tariff  $T_1(w_1, F_1)$ . While the disagreement profit of the upstream supplier refers to zero, the outside option of the retailer equals  $\pi_{0,2}^{D*} = (1 - \delta_2) R(\infty, c)$ . Using our previous results, the profits of both the upstream supplier  $U_1$  and the downstream retailer are given by

$$\begin{aligned} \pi_{1,2}^{D*} &= R(w_1, c) - F_1 - \widehat{F}_2(w_1) \\ &= R(w_1, c) - F_1 - \delta_2 (R(w_1, c) - R(w_1, \infty)), \end{aligned} \quad (20)$$

and

$$\pi_{1,2}^{U_1*} = (w_1 - c) X_1(w_1, c) + F_1, \quad (21)$$

respectively. Thus, the equilibrium bargaining outcome of the retailer and the first supplier can be characterized by the solution of

$$\max_{w_1, F_1} \left( \pi_{1,2}^{U_1*} \right)^{\delta_1} \left( \pi_{1,2}^{D*} - \pi_{0,2}^{D*} \right)^{1-\delta_1}. \quad (22)$$

Maximizing (22) with respect to  $w_1$  and  $F_1$  and rearranging terms, we obtain

$$\frac{\partial}{\partial w_1} [(w_1 - c) X_1(w_1, c) + R(w_1, c)] - \delta_2 \frac{\partial}{\partial w_1} [R(w_1, c) - R(w_1, \infty)] = 0. \quad (23)$$

The first term of (23) determines the impact of an increasing  $w_1$  on the overall industry profit. It becomes zero if the wholesale price equals marginal cost, i.e.  $w_1 = c$ . In turn, the second term refers to the impact of an increasing  $w_1$  on the incremental contribution of the second supplier  $U_2$  (see Lemma 1). Depending on the sign of the second term, the retailer and the first supplier tend to upward or downward distort the wholesale price  $w_1$ .

**Lemma 2** *If trade takes place between the retailer and the first supplier  $U_1$ , there exists a unique equilibrium wholesale price that is either downward or upward distorted, i.e.*

$$\hat{w}_1 = c - \frac{\delta_2 (X_1(\hat{w}_1, c) - X_1(\hat{w}_1, \infty))}{\partial X_1(\hat{w}_1, c) / \partial w_1}. \quad (24)$$

The respective fixed fee refers to

$$\begin{aligned} \hat{F}_1 &= -(1 - \delta_1) (\hat{w}_1 - c) X_1(\hat{w}_1, c) \\ &+ \delta_1 [(1 - \delta_2) [R(\hat{w}_1, c) - R(\infty, c)] + \delta_2 R(\hat{w}_1, \infty)]. \end{aligned} \quad (25)$$

**Proof.** See Appendix. ■

The distortion of the wholesale price in the first stage enables the retailer to extract rent from the second supplier. The direction of distortion is indicated by the sign of  $\Delta X = X_1(\hat{w}_1, c) - X_1(\hat{w}_1, \infty)$ .<sup>12</sup> For  $\Delta X > 0$  the wholesale price is upward distorted, while it is downward distorted as long as  $\Delta X \leq 0$ . The actual sign of  $\tilde{X}_1(\hat{w}_1, c) - \tilde{X}_1(\hat{w}_1, \infty)$  depends on the trade-off between the substitution effect, i.e.  $x_1(\hat{w}_1, c) - x_1(\hat{w}_1, \infty) < 0$ , and the complementarity effect induced by consumer one-stop shopping behavior, i.e.  $\theta(\hat{w}_1, c) - \theta(\hat{w}_1, \infty) > 0$ .

**Lemma 3** *There exists a threshold  $\sigma^k$  that is implicitly given by  $X_1(c, c, \cdot) \equiv X_1(c, \infty)$ . For all  $\sigma < \sigma^k$  ( $\sigma \geq \sigma^k$ ) the wholesale price negotiated with the first supplier is upward (downward) distorted. The extent of the distortion, i.e.  $|\hat{w}_1 - c|$ , is increasing in the bargaining power of the second supplier, i.e.  $\delta_2$ .*

<sup>12</sup>This is true since  $\partial \tilde{X}_i(w_i, c) / \partial w_i < 0$  always holds.

**Proof.** See Appendix. ■

As long as products are sufficiently strong substitutes ( $\sigma \geq \sigma^k$ ), the substitution effect dominates the complementarity effect. This provides the retailer and the first supplier with an incentive to negotiate a per-unit price that undercuts marginal costs.<sup>13</sup> That is, a lower wholesale price for the first good increases the retailer's opportunity costs of buying from the second supplier. This strengthens the retailer's disagreement payoff in the negotiation with the second supplier. If instead goods are sufficiently differentiated ( $\sigma < \sigma^k$ ), the complementarity effect dominates the substitution effect. The positive demand externalities resulting from shopping costs imply that an increasing wholesale price for good 1 does not only reduce the demand for good 1, it also lowers the demand for good 2. Correspondingly, upward distortion of the wholesale price reduces the incremental contribution of the second supplier in the case of highly differentiated products and enables the retailer and the first supplier to extract rents from the second supplier. The direction of distortion, therefore, depends on the degree of product differentiation. The more differentiated the products are the more likely the wholesale price is upward distorted (Figure 1).

The bargaining power of the second supplier, i.e.  $\delta_2$ , has no impact on whether the wholesale price is upward or downward distorted. It only affects the extent of distortion (see (24)). The distortion of the wholesale price induces inefficiencies which have to be compensated by the benefit of shifting rent from the second supplier. That is, the retailer distorts the wholesale price with the first supplier to get a larger share of a smaller pie. Though the distortion of the wholesale price increases the share of the overall profit for the first supplier and the retailer, it reduces the overall profit at the same time. Accordingly, the retailer and the first supplier have hardly any incentive to distort the wholesale price if the retailer has a strong bargaining position vis-à-vis the second supplier.

If the wholesale price undercuts marginal costs, i.e.  $\sigma \geq \sigma^k$ , the retailer has to compensate the first supplier by paying a fixed fee. Otherwise the first supplier's participation constraint would be violated. If instead, the wholesale price is upward distorted, i.e.  $\sigma < \sigma^k$ , it is rather the case that the first supplier and the retailer share the rent shifted from the second supplier by a slotting fee paid by the first supplier. The first supplier gets a larger share of the shifted rent

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<sup>13</sup>Note that the result where the substitution effect dominates coincides with the findings of Marx and Shaffer (1999).

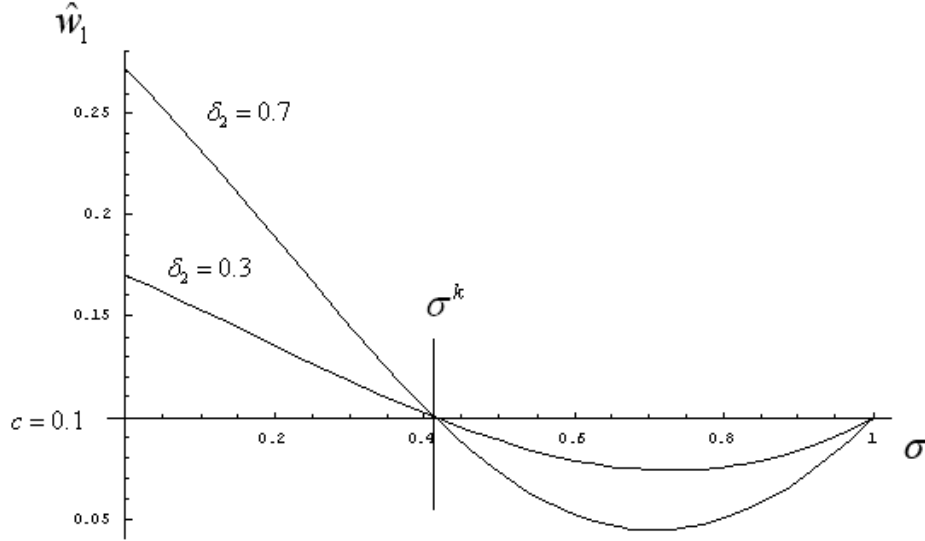


Figure 1: Wholesale price  $\hat{w}_1$  in  $\sigma \in (0, 1)$  for  $c = 0.1$

from the second supplier the higher her bargaining power vis-à-vis the retailer. Accordingly, the fixed fee  $F_1$  is increasing in the first supplier's bargaining power, i.e.  $\delta_1$ .<sup>14</sup> There exists a threshold  $\delta_1^k$ , which is implicitly given by  $\hat{F}_1(\delta_1^k) \equiv 0$ . Using (25), we get

$$\delta_1^k = \frac{(\hat{w}_1 - c)X_1(\hat{w}_1, c)}{(\hat{w}_1 - c)X_1(\hat{w}_1, c) + (1 - \delta_2)(R(\hat{w}_1, c) - R(\infty, c)) + \delta_2 R(\hat{w}_1, \infty)}. \quad (26)$$

For all  $\delta_1 < \delta_1^k$ , the first supplier pays a slotting fee to the retailer. Comparative statics further show that  $\delta_1^k$  is increasing in  $\delta_2$ . Hence, the retailer is more likely to charge slotting fees from the first supplier the more bargaining power the second supplier has. Our results further reveal that the higher the bargaining power of the second supplier, i.e. the higher  $\delta_2$ , and the lower the bargaining power of the first supplier, i.e. the lower  $\delta_1$ , the higher the slotting fees the first supplier has to pay. That is, a higher bargaining power of the second supplier makes it more profitable for the retailer to distort the wholesale price with the first supplier to extract rent from the second supplier. In addition, the first supplier is more likely to compensate the retailer for the increased wholesale

<sup>14</sup>Note that the derivative  $d\hat{F}_1/d\delta_1$  is strictly positive as we obtain  $d\hat{F}_1/d\delta_1 = (\hat{w}_1 - c)X_1(\hat{w}_1, c) + (1 - \delta_2)[R(\hat{w}_1, c) - R(\infty, c)] + \delta_2 R(\hat{w}_1, \infty) > 0$ .



price the lower her bargaining power.

**Proposition 1** *The retailer charges slotting fees from the first supplier if products are sufficiently strongly differentiated, i.e.  $\sigma < \sigma^k$ , and if the first supplier's bargaining power is relatively low, i.e.  $\delta_1 < \delta_1^k$ . Furthermore, comparative statics reveal that slotting fees are more likely to occur if the second supplier's bargaining power is increasing, i.e.  $\partial\delta_1^k/\partial\delta_2 > 0$ .*

**Proof.** See Appendix. ■

Obviously, slotting fees do not arise if the retailer makes take-it-or-leave-it offers, i.e.  $\delta_1 = \delta_2 = 0$ . Due to her exogenously given bargaining power the retailer captures overall profits such that she has no incentive to distort the wholesale price in the first negotiation. Thus, slotting fees would never occur. This result may coincide with the observation that large and powerful retailers like Wal-Mart or Costco never ask for slotting fees (FTC 2001).

## 4 Social Welfare

Our previous analysis has shown that slotting fees arise as a result of a rent-shifting mechanism in a sequential bargaining framework. However, slotting fees do not occur if the retailer negotiates simultaneously with her suppliers implying wholesale prices for both products equal to marginal costs ("marginal-cost pricing regime"). In order to assess the welfare implications of slotting fees, we compare social welfare in the case of an upward distorted wholesale price in the first negotiation with the social welfare under a marginal-cost pricing regime.

Social welfare is given by the sum of consumer surplus and overall industry profit, i.e.  $W = CS + \Pi$ . Consumer surplus is given by

$$CS = 2 \int_0^{\theta(w_1, c)} \left[ U(\cdot) - x_0(w_1, c, \theta) - \sum_{i=1}^2 p_i^*(w_1, c) x_i(w_1, c) - \theta t \right] d\theta, \quad (27)$$

which simplifies to

$$CS = 2 \left[ u(x_1, x_2) - \sum_{i=1}^2 p_i^*(w_1, c) x_i(w_1, c) \right] \theta(w_1, c) - \theta^2(w_1, c) t.$$

The industry profit corresponds to

$$\Pi = \left( \sum_{i=1}^2 p_i^*(w_1, c) x_i(w_1, c) - \sum_{i=1}^2 c x_i(w_1, c) \right) 2\theta(w_1, c). \quad (28)$$

Using  $\theta(w_1, c) = (U(\cdot) - x_0(w_1, c, \theta) - \sum_{i=1}^2 p_i^*(w_1, c) x_i(w_1, c))/t$ , differentiating (27) with respect to  $w_1$  and applying the envelope theorem, we obtain

$$\frac{\partial CS}{\partial w_1} = -\frac{\partial p_1^*(w_1, c)}{\partial w_1} X_1(w_1, c) < 0. \quad (29)$$

Hence, consumer surplus is strictly decreasing in  $w_1$  indicating that a higher degree of upward distortion negatively affects consumer surplus. In turn, below-cost pricing occurring in the case of strong substitutes benefits consumers. The overall industry profit, however, is maximized for a wholesale price equal to marginal costs because of

$$\frac{\partial \Pi}{\partial w_1} = (w_1 - c) \frac{\partial X_1(w_1, c)}{\partial w_1} \leq 0 \text{ for } w_1 \geq c.$$

While the overall industry profit is increasing in  $w_1$  for all  $w_1 \leq c$ , it is decreasing for all  $w_1 > c$ . Hence, an upward distortion of the wholesale price negotiated with the first supplier reduces both consumer surplus as well as industry profit compared to the marginal-cost pricing regime. Accordingly, we can state:

**Lemma 4** *Slotting fees induced by a rent-shifting mechanism and an upward distortion of the wholesale price negotiated with the first supplier imply a welfare loss.*

Note that slotting fees simply serve as a means of transferring rents from the first supplier to the retailer. Thus, they do not affect social welfare. The welfare loss rather refers to the upward distortion of the wholesale price negotiated with the first supplier which is the precondition for the emergence of slotting fees in vertical relations. The retailer's incentive to optimally distort the wholesale price in the first negotiation is limited if there is no possibility to get rents transferred from the first supplier as in the case of forbidden slotting fees.

Considering the negotiations of the retailer and the first supplier when slotting fees are forbidden, i.e. under the constraint that  $F_1 \geq 0$ , the bargaining outcome is characterized by

$$\tilde{w}_1, \tilde{F}_1 := \arg \max_{w_1, F_1} \left( \pi_{1,2}^{U_1^*} \right)^{\delta_1} \left( \pi_{1,2}^{D^*} - \pi_{0,2}^{D^*} \right)^{1-\delta_1} \text{ s.t. } F_1 \geq 0. \quad (30)$$

As the constraint  $F_1 \geq 0$  is binding for all  $\delta_1 < \delta_1^k$ , we get:

**Proposition 2** *If slotting fees are prohibited, the wholesale price in the first negotiation is less distorted, i.e.  $\tilde{w}_1 < \hat{w}_1$  if  $\delta_1 < \delta_1^k$  and  $\tilde{w}_1 = \hat{w}_1$  otherwise. Note the distortion of the wholesale price is increasing in the bargaining power of the first supplier, i.e.  $d\tilde{w}_1/d\delta_1 > 0$ .*

**Proof.** See Appendix. ■

Under a ban of slotting fees there is no possibility to shift rents from the first supplier to the retailer. Accordingly, the retailer and the first supplier have to share their joint profit by a linear wholesale price. Obviously, this reduces the retailer's incentive to distort the wholesale price in the first negotiation since transfers are not allowed through slotting fees. As a ban of slotting fees makes the upward distortion of the wholesale price in the first negotiation less attractive, it reduces the inefficiencies in the first negotiation. Thus, social welfare is increasing if the use of slotting fees in vertical relations is forbidden. Moreover, the retailer's incentive to distort the wholesale price in the first negotiation is likewise reduced the more bargaining power the retailer has. In other words, the more bargaining power the retailer has the more she tends to maximize the overall industry profit.

## 5 Order of Negotiation

So far, we have taken the order of negotiations as exogenous. We relax this assumption in order to examine whether suppliers with relatively strong or relatively low bargaining power are more likely to be the first the retailer negotiates with. For this purpose we introduce a zero stage, where the retailer decides with whom of her suppliers she negotiates first. Without loss of generality, we assume that supplier  $U_1$  has less bargaining power than supplier  $U_2$ , i.e.  $\delta_1 < \delta_2$ .

Our previous results indicate that the distortion of the wholesale price is increasing in the bargaining power of the second supplier. If the retailer negotiates first with the weaker supplier, i.e.  $U_1$ , the distortion becomes larger, but the benefits from rent-shifting are increasing too. However, when negotiating first with the stronger supplier, i.e.  $U_2$ , there is less distortion of the wholesale price, but also the gains from rent-shifting are lower. It turns out that the retailer is strictly

better off when negotiating first with the weaker supplier in order to improve her bargaining position vis-à-vis the stronger supplier.<sup>15</sup>

**Proposition 3** *The retailer prefers to negotiate first with the less powerful supplier. This implies that the supplier with the lower bargaining power is more likely to pay a slotting fee than the supplier with the higher bargaining power. Furthermore, the endogenous order of negotiation makes the emergence of slotting fees more likely.*

As the distortion of the wholesale price negotiated with the first supplier is increasing in the second supplier's bargaining power (see Proposition 1), our results imply the following:

**Corollary** *The choice of the retailer to negotiate first with the less powerful supplier compared to a regime, where she negotiates first with the more powerful supplier is welfare decreasing for all  $\sigma < \sigma^k$ .*

Due to the retailer's preference to negotiate first with the weaker supplier, the supplier with the relatively higher level of bargaining power never pays slotting fees. In turn, the supplier with the lower level of bargaining power is charged a slotting fee as long as her bargaining power is sufficiently low. Moreover, the higher the bargaining power of the second supplier the more likely the first supplier has to pay a slotting fee to the retailer, since  $\partial\delta_1^k/\partial\delta_2 > 0$  (see Proposition 1).

Our findings confirm the concerns of small manufacturers which are commonly associated with a low level of bargaining power. They complain that they have to pay slotting fees to get their products distributed by the retailer, while their larger competitors do not. We even find that the likelihood of slotting fees to be paid by the small suppliers is increasing in the asymmetry of suppliers. That is, the more bargaining power the second supplier has compared to the bargaining power of the first supplier, the more likely slotting fees are charged by the retailer.

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<sup>15</sup>Similar results have been obtained by Marx and Shaffer (2007a). However, we extend their work by allowing for rent shifting contracts as introduced in Marx and Shaffer (1999). In Marx and Shaffer (1999) as well as in our model quantities are generally distorted such that they do not maximize the overall joint payoff of all three parties.

## 6 Conclusion

We have shown that a rent-shifting mechanism in a three-party negotiation framework results in slotting fees to be paid by manufacturers if consumers bear shopping costs. We consider a simple vertical structure with one retailer that negotiates sequentially with two upstream suppliers of imperfect substitutes about a non-linear delivery contract. Both goods are supposed to belong to consumer shopping basket. Taking consumer shopping costs explicitly into account, positive demand externalities arise between both goods offered at the retailer. If this complementarity effect dominates the original substitution effect, the wholesale price in the first negotiation is upward distorted. This reduces the demand for the first product. At the same time, it lowers the demand for the second good because of the complementarity induced by consumer shopping costs. Thus, the bargaining position of the retailer vis-à-vis the second supplier improves and enables the retailer together with the first supplier to shift rent from the second. In this case, slotting fees are used to share the shifted rent as the first supplier becomes residual claimant to the shifted rent.

Our model allows us to explain why slotting fees may vary within categories. That is, the supplier the retailer negotiates first with might pay slotting fees, while the second supplier never does. We further show that the retailer has always an incentive to negotiate first with the weaker supplier in order to improve her bargaining position vis-à-vis the more powerful second supplier. Accordingly, our analysis reveals various hypotheses that are empirically testable. First, slotting allowances are more likely to be paid by suppliers with relatively little bargaining power vis-à-vis the retailer. Second, slotting allowances are more likely to occur, the more suppliers differ in their bargaining strength vis-à-vis the retailer. In other words, slotting fees are more likely to be charged by retailers the more the producers in a particular product category differ in their bargaining power vis-à-vis the retailer. We also find that powerful retailers never charge slotting fees as they already capture a large share of the industry profit.

In our framework, slotting fees are not necessarily used to exploit those suppliers that pay them. At the opposite, they are induced by a rent-shifting mechanism at the expenses of those suppliers that do not pay slotting fees, i.e. the more powerful suppliers in the intermediate good market. That is, slotting fees serve as a means to exploit rents from the more powerful suppliers the retailer negotiates

in the second place with. Even though slotting fees only transfer rents between vertically related agents, their occurrence comes along with a welfare loss. This is due to the fact that slotting fees are induced by an upward distorted wholesale price in the first negotiation. As wholesale prices are less distorted if slotting fees are forbidden, we can state that a ban of slotting fees would improve social welfare.

## Appendix

**Proof of Lemma 1.** Maximizing (19) with respect to  $w_2$  and  $F_2$ , we obtain the following first order conditions

$$\begin{aligned}\frac{\partial NP_2}{\partial w_2} &= \delta_2 (\pi_{1,2}^{D*} - \pi_{1,0}^{D*}) \frac{\partial \pi_{1,2}^{U_2^*}}{\partial w_2} + (1 - \delta_2) \pi_{1,2}^{U_2^*} \frac{\partial [\pi_{1,2}^{D*} - \pi_{1,0}^{D*}]}{\partial w_2} = 0 \quad (31) \\ \frac{\partial NP_2}{\partial F_2} &= \delta_2 (\pi_{1,2}^{D*} - \pi_{1,0}^{D*}) - (1 - \delta_2) \pi_{1,2}^{U_2^*} = 0. \quad (32)\end{aligned}$$

Using (31) and (32), we easily obtain

$$\frac{\delta_2 (\pi_{1,2}^{D*} - \pi_{1,0}^{D*})}{(1 - \delta_2) \pi_{1,2}^{S_2^*}} = - \frac{\partial (\pi_{1,2}^{D*} - \pi_{1,0}^{D*}) / \partial w_2}{\partial \pi_{1,2}^{S_2^*} / \partial w_2} = 1, \quad (33)$$

implying

$$-\partial (\pi_{1,2}^{D*} - \pi_{1,0}^{D*}) / \partial w_2 = \partial \pi_{1,2}^{U_2^*} / \partial w_2. \quad (34)$$

Using (34) and applying the envelope theorem, we get

$$(w_2 - c) \partial X_2(w_1, w_2) / \partial w_2 = 0. \quad (35)$$

The equality is fulfilled for

$$\hat{w}_2 = c. \quad (36)$$

Combining (36) together with (32), we obtain

$$\hat{F}_2(w_1) = \delta_2 (R(w_1, c) - R(w_1, \infty)). \quad (37)$$

**Proof of Lemma 2:** Maximizing (22) with respect to  $w_1$  and  $F_1$ , we obtain

the following first order conditions

$$\frac{\partial NP_1}{\partial w_1} = \delta_1 (\pi_{1,2}^{D*} - \pi_{0,2}^{D*}) \frac{\partial \pi_{1,2}^{U_1^*}}{\partial w_1} + (1 - \delta_1) \pi_{1,2}^{U_1^*} \frac{\partial (\pi_{1,2}^{D*} - \pi_{0,2}^{D*})}{\partial w_1} = 0 \quad (38)$$

$$\frac{\partial NP_1}{\partial F_1} = \delta_1 (\pi_{1,2}^{D*} - \pi_{0,2}^{D*}) - (1 - \delta_1) \pi_{1,2}^{U_1^*} = 0 \quad (39)$$

$$\text{with : } \frac{\partial \pi_{1,2}^{U_1^*}}{\partial w_1} = X_1(w_1, c) + (w_1 - c) \frac{\partial X_1(w_1, c)}{\partial w_1}$$

$$\text{and : } \frac{\partial (\pi_{1,2}^{D*} - \pi_{0,2}^{D*})}{\partial w_1} = -X_1(w_1, c) + \delta_2 (X_1(w_1, c) - X_1(w_1, \infty)).$$

Using (38) and (39) and applying the envelope theorem, the equilibrium wholesale price  $\hat{w}_1$  is given by

$$\hat{w}_1 = c - \frac{\delta_2 (X_1(\hat{w}_1, c) - X_1(\hat{w}_1, \infty))}{\partial X_1(\hat{w}_1, c) / \partial w_1}. \quad (40)$$

Using (39), the fixed fee is given by

$$\begin{aligned} \hat{F}_1 &= -(1 - \delta_1) (\hat{w}_1 - c) X_1(\hat{w}_1, c) \\ &\quad + \delta_1 [(1 - \delta_2) [R(\hat{w}_1, c) - R(\infty, c)] + \delta_2 R(\hat{w}_1, \infty)]. \end{aligned} \quad (41)$$

**Proof of Lemma 3.** In order to prove the first part of Lemma 3, we assume concavity of the objective function, i.e. the Nash Product formalized in (22).<sup>16</sup> Reformulating (24), we obtain

$$\begin{aligned} \Phi(w_1, \cdot) &= (w_1 - c) \frac{\partial X_1(w_1, c)}{\partial w_1} + \delta_2 (X_1(w_1, c) - X_1(w_1, \infty)) \\ \text{with : } \Phi(\hat{w}_1) &= 0. \end{aligned} \quad (42)$$

Substituting  $w_1 = c$ , we get

$$\Phi(c, \cdot) = \delta_2 (X_1(c, c) - X_1(c, \infty)) = \delta_2 \left[ \frac{27(1-c)^3}{64t} \left( \frac{1}{(1+\sigma)^2} - \frac{1}{2} \right) \right]. \quad (43)$$

Evaluating (43), we obtain that  $\Phi(c) > 0$  holds for all  $\sigma < -1 + \sqrt{2}$ . For  $\sigma \geq -1 + \sqrt{2}$  we get  $\Phi(c) \leq 0$ . Using the concavity of the objective function, the equilibrium wholesale price satisfies  $\hat{w}_1 \geq c$  for  $\sigma \leq -1 + \sqrt{2}$ .

To prove the second part of Lemma 3, i.e.  $d|\hat{w}_1 - c|/d\delta_2 > 0$ , we apply the implicit function theorem to (42). Because of the concavity of (42) we have  $\text{sign}[d\hat{w}_1/d\delta_2] = \text{sign}[\partial\Phi(\hat{w}_1, \delta_2)/\partial\delta_2] = \text{sign}[X_1(\hat{w}_1, c) - X_1(\hat{w}_1, \infty)]$ . The

<sup>16</sup>The concavity has been checked by simulations.

analysis of  $X_1(\widehat{w}_1, c) - X_1(\widehat{w}_1, \infty)$  reveals that  $\partial\Phi(w_1, \delta_2)/\partial\delta_2 < 0$  if  $X_1(\widehat{w}_1, c) - X_1(\widehat{w}_1, \infty) < 0$  and  $\widehat{w}_1 < c$  implying  $d\widehat{w}_1/d\delta_2 < 0$ . Otherwise it holds that  $\partial\Phi(w_1, \delta_2)/\partial\delta_2 > 0$  if  $X_1(\widehat{w}_1, c) - X_1(\widehat{w}_1, \infty) > 0$  and  $\widehat{w}_1 > c$  implying  $d\widehat{w}_1/d\delta_2 > 0$ . Hence, we have  $d|\widehat{w}_1 - c|/d\delta_2 > 0$ .

**Proof of Proposition 1.** The retailer charges slotting allowances from upstream suppliers as long as  $\sigma < \sigma^k$  and  $\delta_1 < \delta_1^k$  (see 26). This can be proven by using  $\widehat{F}_1(\delta_1^k(\delta_2), \delta_2) = 0$ . Applying the implicit function theorem, we get

$$\frac{d\delta_1^k}{d\delta_2} = -\frac{d\widehat{F}_1/d\delta_2}{d\widehat{F}_1/d\delta_1}. \quad (44)$$

Inspection of (25) directly implies that

$$d\widehat{F}_1/d\delta_1 = (\widehat{w}_1 - c)X_1(\widehat{w}_1, c) + R(\widehat{w}_1, c) \quad (45)$$

$$-\delta_2 [R(\widehat{w}_1, c) - R(\widehat{w}_1, \infty)] - (1 - \delta_2) R(\infty, c) > 0.$$

Hence the sign of  $d\delta_1^k(\delta_2)/d\delta_2$  equals the sign of  $-d\widehat{F}_1/d\delta_2$  with

$$-d\widehat{F}_1/d\delta_2 = -\frac{\partial\widehat{F}_1}{\partial w_1} \frac{\partial\widehat{w}_1}{\partial\delta_2} - \frac{\partial\widehat{F}_1}{\partial\delta_2}. \quad (46)$$

For any  $\sigma < \sigma^k$ , we know that  $-\partial\widehat{F}_1/\partial\delta_2 > 0$  since  $\partial\widehat{F}_1/\partial\delta_2 = -\delta_1 [R(\widehat{w}_1, c) - R(\widehat{w}_1, \infty) - R(\infty, c)] < 0$  and,  $\partial\widehat{w}_1(\delta_2)/\partial\delta_2 > 0$  (see Lemma 3). In turn, we have  $-d\widehat{F}_1/d\delta_2 < 0$  if  $-\partial\widehat{F}_1/\partial w_1 > 0$ . To get  $-\partial\widehat{F}_1/\partial w_1 > 0$ , we rewrite  $\widehat{F}_1$  as the sum of two terms,  $-(\widehat{w}_1 - c)X_1(\widehat{w}_1, c)$  and  $\delta_1 [(\widehat{w}_1 - c)X_1(\widehat{w}_1, c) + R(\widehat{w}_1, c) - \delta_2 [R(\widehat{w}_1, c) - R(\widehat{w}_1, \infty)] - (1 - \delta_2) R(\infty, c)]$ . The second term corresponds to the joint profit of the first supplier and the retailer weighted by  $\delta_1$ . The derivative of this term with respect to  $w_1$  is zero, i.e.  $\Phi(\widehat{w}_1) = 0$ . This enables us to write  $-\partial\widehat{F}_1/\partial w_1 = \partial[(w_1 - c)X_1(w_1, c)]/\partial w_1|_{w_1=\widehat{w}_1}$ . Using  $\Phi(\widehat{w}_1) = 0$ , we can write

$$\left[ \frac{\partial(w_1 - c)X_1(w_1, c)}{\partial w_1} + (1 - \delta_2) \frac{\partial R(w_1, c)}{\partial w_1} + \delta_2 \frac{\partial R(w_1, \infty)}{\partial w_1} \right] \Big|_{w_1=\widehat{w}_1} = 0. \quad (47)$$

Since  $\partial[R(w_1, c)]/\partial w_1 < 0$  and  $\partial[R(w_1, \infty)]/\partial w_1 < 0$ , it follows that  $\partial[(w_1 - c)X_1(w_1, c)]/\partial w_1|_{w_1=\widehat{w}_1} > 0$ . Since  $\partial[(w_1 - c)X_1(w_1, c)]/\partial w_1|_{w_1=\widehat{w}_1} > 0$ , it results that  $-d\widehat{F}_1/d\delta_2 > 0$ , implying  $d\delta_1^k/d\delta_2 > 0$ .



**Proof of Proposition 2.** Differentiating (30) with respect to  $w_1$ , we obtain

$$\begin{aligned} \Psi(w_1) &= (1 - \delta_1)(w_1 - c)X_1(w_1, c) \left[ (1 - \delta_2) \frac{\partial R(w_1, c)}{\partial w_1} + \delta_2 \frac{\partial R(w_1, \infty)}{\partial w_1} \right] \\ &\quad + \delta_1 \frac{\partial [(w_1 - c)X_1(w_1, c)]}{\partial w_1} [(1 - \delta_2)(R(w_1, c) - R(\infty, c)) + \delta_2 R(w_1, \infty)] \end{aligned} \quad (48)$$

$$\text{with: } \Psi(w_1)|_{w_1=\hat{w}_1} = 0.$$

Using  $\Phi(w_1)|_{w_1=\hat{w}_1} = 0$  (see 47), we can write

$$\begin{aligned} \Psi(w_1)|_{w_1=\hat{w}_1} &= \frac{\partial(w_1 - c)X_1(w_1, c)}{\partial w_1} \\ &\quad \times \underbrace{\left[ \begin{array}{c} -(1 - \delta_1)(w_1 - c)X_1(w_1, c) + \\ \delta_1 [(1 - \delta_2)(R(w_1, c) - R(\infty, c)) + \delta_2 R(w_1, \infty)] \end{array} \right]}_{T_1} \Bigg|_{w_1=\hat{w}_1}. \end{aligned} \quad (49)$$

Note that the term in brackets  $T_1$  refers to  $\hat{F}_1$ . Since  $\partial(w_1 - c)X_1(w_1, c)/\partial w_1 > 0$  and  $\hat{F}_1 < 0$  for any  $\delta_1 < \delta_1^k$ , it follows that  $\Psi(w_1)|_{w_1=\hat{w}_1} < 0$ . Assuming concavity of the objective function, we get  $\tilde{w}_1 < \hat{w}_1$ .

Applying the implicit function theorem, we analyze the comparative statics, i.e.  $d\tilde{w}_1/d\delta_1 > 0$ . We know that  $\text{sign}[d\tilde{w}_1/d\delta_1] = \text{sign}[\partial\Psi/\partial\delta_1]$  with

$$\begin{aligned} \frac{\partial\Psi}{\partial\delta_1} &= -[(w_1 - c)X_1(w_1, c)] \left[ (1 - \delta_2) \frac{\partial R(w_1, c)}{\partial w_1} + \delta_2 \frac{\partial R(w_1, \infty)}{\partial w_1} \right] \\ &\quad + \frac{\partial [(w_1 - c)X_1(w_1, c)]}{\partial w_1} [(1 - \delta_2)(R(w_1, c) - R(\infty, c)) + \delta_2 R(w_1, \infty)]. \end{aligned} \quad (50)$$

Reformulating and using previous results, we get

$$\begin{aligned} \Psi(\tilde{w}_1) &= \delta_1 [\partial\Psi(\cdot)/\partial\delta_1] \\ &\quad + [(w_1 - c)X_1(w_1, c)] \left[ (1 - \delta_2) \frac{\partial R(w_1, c)}{\partial w_1} + \delta_2 \frac{\partial R(w_1, \infty)}{\partial w_1} \right] \Bigg|_{w_1=\tilde{w}_1} = 0. \end{aligned} \quad (51)$$

Since  $\partial R(w_1, c)/\partial w_1 < 0$  and  $\partial R(w_1, \infty)/\partial w_1 < 0$ , we get from  $\Psi(\tilde{w}_1) = 0$  that  $\partial\Psi(\cdot)/\partial\delta_1 > 0$  implying  $d\tilde{w}_1/d\delta_1 > 0$ .

**Proof of Proposition 3.** Denoting the supplier the retailer negotiates first with by index  $i$  and the second supplier by index  $j$ , the downstream firm's profit is given by

$$\begin{aligned} \pi_{i,j}^D(w_i) &= \delta_i(1 - \delta_j)R(\infty, c) + (1 - \delta_i)[(w_i - c)X_i(w_i, c) + R(w_i, c)] \\ &\quad - (1 - \delta_i)\delta_j[R(w_i, c) - R(w_i, \infty)] \end{aligned} \quad (52)$$

$$\text{with } i = 1, 2, i \neq j.$$

We denote the wholesale prices negotiated at the first stage by  $w_1^*$  if the retailer negotiates first the supplier  $U_1$  (regime 1, 2). Analogously,  $w_2^*$  refers to the wholesale price negotiated in the first stage, if the retailer negotiates first the supplier  $U_2$  (regime 2, 1). Since the distortion of the wholesale price in the first stage is increasing in the bargaining power of the second supplier, we have  $0 < |w_2^* - c| < |w_1^* - c|$  (see Lemma 3). Moreover, we have  $\pi_{1,2}^D(w_1^*) > \pi_{1,2}^D(w_2^*)$  since  $w_1^*$  maximizes the joint profit of the first supplier and the retailer. To prove  $\pi_{1,2}^D(w_1^*) > \pi_{2,1}^D(w_2^*)$ , we have to show that  $\pi_{1,2}^D(w_2^*) > \pi_{2,1}^D(w_2^*)$ . Analyzing the profit of the retailer by changing the order of negotiations, i.e.  $\Delta\pi^D(w_2^*) = \pi_{1,2}^D(w_2^*) - \pi_{2,1}^D(w_2^*)$ , we get

$$\Delta\pi^D(w_2^*) = (\delta_2 - \delta_1) [(w_2^* - c)X_i(w_2^*, c) + R(w_2^*, \infty) - R(\infty, c)]. \quad (53)$$

Since  $(\delta_2 - \delta_1) > 0$ , we have to show that  $(w_2^* - c)X_i(w_2^*, c) + R(w_2^*, \infty) - R(\infty, c) > 0$ . Denoting  $\bar{w}_1$  the wholesale price negotiated in the first stage for  $\delta_2 = 1$ , we get

$$\left\{ \frac{\partial [ (w_1 - c) X_1(w_1, c) + R(w_1, c) ]}{\partial w_1} - \frac{\partial [ R(w_1, c) - R(w_1, \infty) ]}{\partial w_1} \right\} \Big|_{w_1 = \bar{w}_1} = 0. \quad (54)$$

We rewrite (54) by  $\partial A(w_1)/\partial w_1 - \partial B(w_1)/\partial w_1 = 0$ , where  $A(w_1)$  denotes the industry surplus and  $B(w_1)$  the incremental contribution of the second supplier. Using  $\partial A(w_1)/\partial w_1 < 0$ ,  $\partial B(w_1)/\partial w_1 < 0$  and  $A(w_1)/\partial w_1 - \partial B(w_1)/\partial w_1 > 0$  for any  $w_1 < \bar{w}_1$ , the concavity of objective function reveals

$$A(c) - A(w_1) < B(c) - B(w_1) \quad \forall w_1 < \bar{w}_1. \quad (55)$$

Since  $|w_2^* - c| < |\bar{w}_1 - c|$  (see Lemma 3), we obtain

$$A(c) - A(w_2^*) < B(c) - B(w_2^*) \quad \text{for } w_1 = w_2^*. \quad (56)$$

Rewriting this previous inequality, we get

$$(w_2^* - c)X_i(w_2^*, c) + R(w_2^*, \infty) - R(\infty, c) > 0. \quad (57)$$

Hence, we have  $\pi_{1,2}^D(w_2^*) - \pi_{2,1}^D(w_2^*) > 0$  with  $(\delta_2 - \delta_1) > 0$  (see 53). From  $\pi_{1,2}^D(w_2^*) - \pi_{2,1}^D(w_2^*) > 0$  and  $\pi_{1,2}^D(w_1^*) > \pi_{1,2}^D(w_2^*)$ , we get  $\pi_{1,2}^D(w_1^*) > \pi_{2,1}^D(w_2^*)$ .

## References

- [1] Bedre, Ö. (2008), "Vertical Coordination through Renegotiation and Slotting Fee", Working Paper, Toulouse School of Economics.
- [2] Beggs, A.W. (1994), "Mergers and Malls", *Journal of Industrial Economics* 42: 419-428.
- [3] Binmore, K., Rubinstein, A., and A. Wolinsky (1986), "The Nash Bargaining Solution in Economic Modelling", *RAND Journal of Economics* 17: 176-188.
- [4] Bonanno, G. and J. Vickers (1988), "Vertical Separation", *Journal of Industrial Economics* 36: 257-265.
- [5] Caillaud, B. and P. Rey (1995), "Strategic aspects of vertical delegation", *European Economic Review* 39: 421-431.
- [6] Competition Commission (2000): "Supermarkets: A Report on the Supply of Groceries from Multiple Stores in the United Kingdom", The Stationary Office, London, UK.
- [7] Chu, W. (1992), "Demand Signaling and Screening in Channels of Distribution", *Marketing Science* 11: 327-47.
- [8] DeVuyst, C.S. (2005), "Demand Screening with Slotting Allowances and Failure Fees", *Journal of Agricultural & Food Industrial Organization* 3: Article 6.
- [9] European Commission (1999), "Buyer Power and its Impact on Competition in the Food Retail Distribution Sector of the European Union", Report produced for the European Commission, D IV, Brussels.
- [10] Foros, O. and H. Kind (2008), "Do slotting allowances harm retail competition?", *Scandinavian Journal of Economics* 110: 367-384.
- [11] FTC (2001), "Report on the Federal Trade Commission Workshop on Slotting Allowances and Other Marketing Practices in the Grocery Industry", available at: <http://www.ftc.gov/os/2001/02/slottingallowancesreportfinal.pdf>

- [12] FTC (2003), "Slotting Allowances in the Retail Grocery Industry: Selected Case Studies in Five Product Categories", available at: <http://www.ftc.gov/os/2003/11/slottingallowancercpt031114.pdf>.
- [13] Kelly, K. (1991), "The antitrust analysis of grocery slotting allowances: The procompetitive case", *Journal of Public Policy and Marketing* 10: 187-198.
- [14] Kuksov, D. and A. Pazgal, "The effects of costs and competition on slotting allowances", *Marketing Science* 26: 187-198.
- [15] Innes, R. and S. F. Hamilton (2009), "Vertical restraints and horizontal control", *RAND Journal of Economics*, forthcoming.
- [16] Innes, R. and S. F. Hamilton (2006), "Naked slotting fees for vertical control of multi-product retail markets", *International Journal of Industrial Organization* 24: 303-318.
- [17] Marx, L.M. and G. Shaffer (2009), "Slotting allowances and endogenous shelf space", forthcoming *Journal of Economics and Management and Strategy*.
- [18] Marx, L. M. and G. Shaffer (2007a), "Rent-shifting and the order of negotiations", *International Journal of Industrial Organization* 25: 1109-1125.
- [19] Marx, L. M. and G. Shaffer (2007b), "Upfront payments and exclusion in downstream markets", *RAND Journal of Economics* 38: 823 - 843.
- [20] Marx, L. M. and G. Shaffer (1999), "Predatory Accommodation: Below-Cost Pricing without Exclusion in Intermediate Goods Markets", *RAND Journal of Economics* 30: 22-43.
- [21] Miklos-Thal, J., Rey, P. and T. Vergé (2009), "Buyer power and intrabrand coordination", forthcoming *Journal of the European Economic Association*.
- [22] Nocke, V. and J. Thanassoulis (2010), "Vertical Relations Under Credit Constraints", Working Paper University of Oxford.
- [23] Rey, P. and J. Stiglitz (1988), "Vertical restraints and producers' competition", *European Economic Review* 32: 561-568.
- [24] Shaffer, G. (2005), "Slotting Allowances and Optimal Product Variety", *B.E. Journals in Economic Analysis & Policy*.

- [25] Shaffer, G. (1991), "Slotting Allowances and Resale Price Maintenance: A Comparison of Facilitating Practices", *RAND Journal of Economics* 22: 120-135.
- [26] Stahl, K. (1987), "Theories of Urban Business Location", in: E.S. Mills (ed.), *Handbook of Regional and Urban Economics*, Vol. 2, Elsevier Science Publishers, Amsterdam.
- [27] Stahl, K. (1982), "Location and Spatial Pricing Theory with Nonconvex Transportation Cost Schedules", *Bell Journal of Economics* 13: 575-582.
- [28] Sullivan, M. (1997), "Slotting Allowances and the Market for New Products", *Journal of Law and Economics* 40: 461-493.