Slotting Allowances and Conditional Payments*

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Abstract

We analyze the competitive effects of upfront payments made by manufacturers to retailers in a contracting situation where rival retailers offer contracts to a manufacturer. In contrast to Bernheim and Whinston (1998), who study the situation in which competing manufacturers offer contracts to a monopoly retailer, we find that non-contingent two-part tariffs do not suffice to implement the monopoly outcome. More complex contracts are required to internalize all the contracting externalities from common agency. In particular, slotting allowances appear to be necessary to maximize joint profits. A (contingent) three-part tariff that combines an upfront payment with a two-part tariff conditional on actual trade, for example, is sufficient to restore the monopoly outcome. The welfare implications are ambiguous. On the one hand, slotting allowances ensure that no efficient retailer is excluded. On the other hand, they allow firms to fully collude in a common agency situation.

Keywords: Vertical contracts, slotting allowances, buyer power, common agency

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1 Introduction

In recent years, payments made by manufacturers to retailers have triggered heated debates.[1] The term slotting allowance usually encompasses different kinds of such payments: slotting fees for access to (premium) shelf space, advertising fees for promotional activities, fees related to the introduction of new products, or listing and pay-to-stay fees that suppliers pay to be or remain on the retailer's (formal or informal) list of potential suppliers. Such payments are not negligible: according to a recent study published by the FTC (2003), *"for those products with slotting allowances, the average amount of slotting allowances (per item, per retailer, per metropolitan area) for all five categories combined ranged from \$2,313 to \$21,768. (...) Most of the surveyed suppliers reported that a nationwide introduction of a new grocery product would require \$1.5 to \$2 million in slotting allowances."*

In France, manufacturers have long been complaining about the growing magnitude of slotting allowances and hidden margins, and these practices have been at the center of the debate about the 2005 reform of the *1996 Galland Act.* Splitting the total margin made by a retailer on a product into the *observable margin* (which includes all rebates written on the original invoice and the retailer's margin) and the *hidden margin* (which includes negotiated slotting allowances and conditional rebates such as listing fees paid at the end of the year), Allain and Chambolle (2005) claim that the hidden margin represented on average 88 percent of the total margin made by French supermarkets on grocery products in 1999.

While pro-competitive justifications have been brought forward for fees related to the allocation of shelf space, advertising or the introduction of new products, listing or pay-to-stay fees are particularly contentious.[2] In the UK for example, where 58 percent of large suppliers reported in 2000 that major supermarket chains requested listing fees,[3] the supermarkets code of practice introduced in 2001 prohibits lump sum fees not related

[1] See for example the reports by the FTC (2001) in the U.S. or the Competition Commission (2000) in the U.K.

[2] Slotting fees are often considered to be an efficient way to allocate scarce shelf space (however, there is some concern that large manufacturers may use such fees to exclude smaller competitors whose pockets are not deep enough to match such offers – see Bloom et al. (2000), and Shaffer (2005) for a formal analysis). Fees related to promotional activities can be a way to compensate a retailer for additional effort. Fees related to the introduction of a new product may serve risk-sharing, signaling or screening purposes (see Kelly (1991)).

[3] See Table 11.5 of the report by the Competition Commission (2000).

to promotional activities or to the introduction of a new product (a recent report shows, however, that listing fees continue to be common).[4]

The economic literature on listing fees and more generally on slotting allowances has first focused on manufacturers' incentives to offer such payments. Shaffer (1991) shows that even perfectly competitive manufacturers can dampen retail competition by offering wholesale prices above marginal cost and compensate retailers by means of slotting allowances. Yet, in the grocery industry for example, the general perception is that bargaining power has shifted towards large retail chains in recent years.[5] On the one hand, large supermarket chains often account for a high share of a manufacturer's production: in the UK, even large manufacturers typically rely on their main buyer for more than 30 percent of domestic sales. The business of the leading manufacturer, on the other hand, usually represents a very small proportion of business for each of the major multiples. While large manufacturers certainly continue to possess a strong bargaining position on some must-stock brands, this strength does not necessarily carry over to other goods, since negotiations mostly take place on a product-by-product basis.[6]

Real-world evidence indicates that both the incidence and the magnitude of slotting allowances are associated with the exercise of retail bargaining power.[7] To capture this idea, Marx and Shaffer (2004) consider a model of vertical negotiations where retailers have the initiative and show in that context that strong retailers can exclude other retailers, by offering "three-part tariffs", which include negative upfront payments (slotting allowances), paid by the manufacturer even if the retailer does not buy anything afterwards, and conditional fixed fees, paid by the retailer only if it actually buys from the manufacturer.

Building on their analysis, we find that retailers may use upfront payments and conditional fixed fees to achieve monopoly profits in a common agency situation, i.e. when distributing the good of a common supplier. More precisely, we consider the role of conditional fixed fees and upfront payments in determining: (i) whether exclusion is a profitable strategy for a retailer, and (ii) the levels of prices in a common agency situation. As in

[4] See Office of Fair Trading (2004).

[5] See Inderst and Wey (2004) for more evidence on the retailers' growing bargaining power in different sectors both in Europe and in the US.

[6] See the supermarket report published by the Competition Commission (2000).

[7] See the FTC (2001) staff report for instance. The Competition Commission (2000) states that "*some suppliers said that they regarded these charges as exploitation of the power differences between the retailer and the supplier.*"

Marx and Shaffer (2004), we consider a situation where two rival retailers offer public take-it-or-leave-it contracts to a single manufacturer; however, we allow contracts to be contingent on exclusivity. This assumption can be motivated in two ways. First, one might indeed expect firms to discuss what would be the terms for both options (exclusivity or not). Second, even when firms negotiate a non-contingent contract, they do so with a given market structure in mind, and they would probably renegotiate the terms of the contract if the market configuration turned out not to be as expected.[8] We show that there then exist equilibria where the industry structure (exclusive dealing or common supplier) and the prices maximize industry profits; in other words, firms achieve the fully collusive outcome. Moreover the retailers' preferred equilibrium indeed involves common agency whenever efficient and in this equilibrium, each retailer obtains its marginal contribution to industry profits.

The manufacturer could induce the industry monopoly outcome, even without slotting allowances or conditional fees, if it had the bargaining power. In that case, the manufacturer could offset the competitive pressure on retail prices by charging wholesale prices above costs so as to maintain consumer prices at the monopoly level; and could use fixed feed to extract retail profits. When the retailers have the initiative, however, standard two-part tariffs can no longer yield monopoly profits in a common agency situation, as each retailer has an incentive to free-ride on its rival's revenue by reducing its own price. Furthermore, by reducing the profits that can be achieved in a common agency situation, this free-riding may prevent common agency from actually emerging.

In this context, conditioning fixed fees on actual trade contributes to protect retailers and may restore common agency; and when combined with upfront payments by the manufacturer, conditional fixed fees indeed always allow retailers to preserve common agency and to achieve the industry monopoly profits. The intuition is as follows. Together with wholesale prices above costs, conditional payments equal to the retailers' anticipated (variable) profits serve as a commitment to sustain monopoly prices; upfront payments by the manufacturer can then be used to give ex ante each retailer its full contribution to the industry profits. Last, each retailer can discourage its rival from deviating to exclusivity by adjusting the terms of its own offer for exclusivity. Thus, when combined with conditional fixed fees, upfront payment do not lead to inefficient exclusion but may actually avoid it. Yet, upfront payments are still potentially detrimental for welfare, since

[8] Indeed, contracts often stipulate a clause triggering renegotiation in case of a "material change in circumstances."

they eliminate any pressure from retail competition.

Incidentally, our analysis confirms the observation that slotting allowances are associated with retail bargaining power.[9] While in our model retailers obviously want to use three-part tariffs whenever permitted, the industry monopoly outcome could be achieved without slotting allowances if bargaining power were upstream; standard two-part tariffs would then suffice. Once retailers have the bargaining power, however, upfront payments are necessary to maintain monopoly prices. Our paper is also related to the literature on contracting with externalities. Bernheim and Whinston (1985) show that manufacturers can use a common agent to coordinate and achieve monopoly prices. Bernheim and Whinston (1998) examine exclusive and common dealing situations and analyze whether a manufacturer can profitably exclude a rival from distribution, when the initiative to offer contracts lies upstream. Because of the compensation required by a monopoly retailer, and in the absence of any contracting externalities, exclusion cannot occur unless even an industry monopolist would only distribute one product; common agency thus arises as long as it is efficient, and standard (non-contingent) two-part tariffs suffice to achieve it. Contracting externalities can arise for example from a restriction on contracts,[10] or from third parties not present at the contracting stage.[11]

More recently, Martimort and Stole (2003) as well as Segal and Whinston (2003) have analyzed bidding games where rival retailers simultaneously offer supply contracts to a monopolist manufacturer. They find that common agency may arise in equilibrium but always involves some degree of retail competition; the outcome of the common agency game is therefore always inefficient from the firms' point of view. As we will see later the key assumptions explaining the differences between their results and ours are that, although tariffs are offered in both cases by the downstream firms (who thus have the bargaining power), in their setup: (*i*) quantities are chosen by the upstream firm; and (*ii*) contracts cannot be contingent on market structure. Given that we are interested in relationships between manufacturers and retailers, we believe that it is more realistic to

[9] Inderst (2005) also looks at the role of buyer power and slotting allowances, but in a context where manufacturers supply a monopolist retailer. He shows that, when the retailer has a weak bargaining power vis-à-vis the manufacturers, the retailer might find it desirable to commit ex ante to exclusivity (and transform de facto upstream competition into an auction where manufacturers bid on slotting allowances).

[10] For instance, Mathewson and Winter (1987) consider a restriction to linear prices.

[11] For example, an incumbent manufacturer can sometimes profitably prevent efficient entry: see Aghion and Bolton (1987), Rasmusen *et al.* (1991), Segal and Whinston (2000) and Comanor and Rey (2000).

assume that the downstream firms are the ones choosing how much to procure.

The paper is organized as follows. Section 2 outlines the general framework. Section 3 derives upper bounds on retailers' rents, which will serve as benchmarks in the following analysis. Sections 4 to 6 consider different classes of contracts: classic two-part tariffs with an upfront fixed fee, two-part tariffs with a conditional fixed fee and finally three-part tariffs combining both types of fees. Section 7 links our results to the existing literature and discusses the policy implications of our findings. The final section concludes.

2 Framework

Two differentiated retailers, R_1 and R_2, distribute the product of a manufacturer M. The manufacturer produces at constant marginal cost c, while retailers incur no additional distribution costs. Retailers have all the bargaining power in their bilateral relations with the manufacturer; their interaction is therefore modeled as follows:

1. R_1 and R_2 simultaneously make take-it-or-leave-it offers to M. Offers can be contingent on exclusivity, that is, each retailer R_i offers a pair of contracts $\left(C_i^C, C_i^E\right)$ where C_i^C and C_i^E respectively specify the terms of trade when the manufacturer has accepted both offers or R_i's offer only.[12] The offers are thus only contingent on acceptance decisions.

2. M decides whether to accept both, only one, or none of the offers. All offers and acceptance decisions are public.

3. The retailers with accepted contracts compete on the downstream market and the relevant contracts are implemented.

We do not specify how competition takes place on the retail market; in particular our results are valid for quantity as well as price competition. Denoting by[13] $P_i\left(q_i, q_{-i}\right)$ the inverse demand function at store $i = 1, 2$ when R_i sells q_i units of the good and R_{-i} sells q_{-i} units, we denote by Π^m the maximum profit that can be achieved by a fully integrated firm:

$$\Pi^m = \max_{(q_1,q_2)} \left\{\left(P_1\left(q_1, q_2\right) - c\right) q_1 + \left(P_2\left(q_2, q_1\right) - c\right) q_2\right\}.$$

[12] Throughout the paper, superscripts C and E respectively refer to common agency and exclusive dealing situations.

[13] Throughout the paper, we will use the notation "$-i$" to refer to retailer i's rival.

When only product i is available, a vertically integrated firm (that is, including M and R_i, and assuming that R_{-i} is inactive) maximizing its profit would earn:

$$\Pi_i^m = \max_{q_i} \left\{ \left(P_i \left(q_i, 0 \right) - c \right) q_i \right\}.$$

We assume that the two retailers are imperfect substitutes and, without loss of generality, that R_1 is on its own at least as profitable as R_2, that is:

$$\Pi_1^m + \Pi_2^m > \Pi^m > \Pi_1^m \geq \Pi_2^m.$$

At this point, let us discuss the main assumptions underlying our model. First, the above strict inequalities rule out the cases where the two markets are independent or the two retailers are perfect substitutes. These two cases would be trivial in our setting: when the markets are independent, two-part tariffs would suffice to achieve the monopoly outcome, while exclusive dealing would be efficient (and the associated monopoly profits easily achieved) when there is perfect substitutability.

Second, we have assumed that contracts are public. Since the manufacturer observes both offers at stage 1, no problem of opportunism arises vis-à-vis the supplier even when the retailers cannot observe contracts. However, if retailers did not observe contracts before competing on the product market, each retailer would have an incentive to free-ride on the other, thereby limiting the retailers' ability to avoid competition.[14]

Last, as already mentioned, we allow contracts to be contingent on exclusivity. This reflects the fact that in practice firms may indeed explore both options, and can also be viewed as a "short-cut" capturing the possibility of renegotiation in case of a refusal to deal. An alternative approach would be to introduce an explicit dynamic multilateral framework: this is for example the route followed by de Fontenay and Gans (2005a) who use the bargaining model developed by Stole and Zwiebel (1996). They consider contracts that stipulate a given quantity for a given total price, and show that while the outcome is bilaterally efficient, it fails to maximize the industry profits.[15] In our framework, too, contracts will be bilaterally efficient, but we show that, rich enough contracts combining upfront payments and conditional fixed fees achieve joint-profit maximization.

[14] If contracts were secret, each pair would maximize its joint profit - which includes the whole margin on the sales made by the retailer and the upstream margin on the rival retailer's sales - thereby leading to the competitive outcome (wholesale prices at marginal cost) as shown by O'Brien and Shaffer (1992).

[15] See also de Fontenay and Gans (2005b) who use a similar approach to study the impact of vertical integration.

3 Common Agency Profits

Before turning to specific contractual relationships, it is useful to derive bounds on equilibrium payoffs for common agency situations. We will only assume here that, when retailer R_{-i} is inactive, the pair $R_i - M$ can achieve and share the bilateral monopoly profit Π_i^m as desired.[16] We denote by Π^C the equilibrium industry profits under common agency, and by π_1^C, π_2^C and π_M^C, respectively, the retailers' and the manufacturer's equilibrium profits. By definition, Π^C cannot exceed the industry monopoly profits Π^m; it may however be lower if contracting externalities prevent the maximization of joint profits in equilibrium.

In any common agency equilibrium, the joint profits of the vertical pair $R_i - M$ must exceed the bilateral profit it could achieve by excluding R_{-i}: indeed, if $\pi_i^C + \pi_M^C < \Pi_i^m$, then R_i could profitably deviate by offering an exclusive dealing contract generating the bilateral monopoly profit and leaving a slightly higher payoff to M.[17] There is thus no profitable deviation to exclusivity if and only if, for $i = 1, 2$:

$$\pi_i^C + \pi_M^C \geq \Pi_i^m. \tag{1}$$

Since by definition, $\pi_i^C + \pi_M^C = \Pi^C - \pi_{-i}^C$, condition (1) (written for "$-i$") implies that R_i's equilibrium profit cannot exceed its contribution to total profits: for $i = 1, 2$,

$$\pi_i^C \leq \Pi^C - \Pi_{-i}^m. \tag{2}$$

These upper bounds imply that the manufacturer's equilibrium payoff π_M^C is always positive:

$$\begin{aligned}
\pi_M^C &= \Pi^C - \pi_1^C - \pi_2^C \\
&\geq \Pi^C - \left(\Pi^C - \Pi_2^m\right) - \left(\Pi^C - \Pi_1^m\right) \\
&= \Pi_1^m + \Pi_2^m - \Pi^C \\
&\geq \Pi_1^m + \Pi_2^m - \Pi^m > 0.
\end{aligned}$$

M's individual rationality constraint is thus strictly satisfied in any common agency equilibrium. Since individual rationality also requires $\pi_i^C \geq 0$ for all i, condition (2) implies

[16] Standard two-part tariffs, for example, can achieve this. The discussion below parallels that of Bernheim and Whinston (1998) who consider the case where upstream firms compete for a downstream monopolist.

[17] For example, a two-part tariff $T_i(q_i) = F_i + cq_i$, with F_i just above π_M^C conditional on exclusivity, would do.

that a common agency equilibrium can only exist if it is more profitable than exclusive dealing, namely if:

$$\Pi^C \geq \Pi_1^m. \tag{3}$$

In the next three sections, we will successively consider two-part tariffs with upfront fees, two-part tariffs with conditional fixed fees and three-part tariffs (combining upfront and conditional fixed fees) and look at the conditions under which the inequality (3) is satisfied. This will also allow us the identify the exact roles played by the different types of fixed fees (upfront or conditional).

4 Two-part Tariffs

Bernheim and Whinston (1985, 1998) have shown that, when rival manufacturers deal with a common retailer, simple two-part tariffs that consist of a constant wholesale price and a fixed fee suffice to achieve the industry monopoly profits. Although they focused on the case where manufacturers have the bargaining power in their bilateral relations with the common agent, their conclusions remain valid when the retailer has the initiative: in both instances, the retailer plays the role of a "gatekeeper" for consumers and fully internalizes, through marginal cost pricing, any contracting externalities.[18]

When rival retailers deal with a common supplier, and the supplier offers contracts, this result remains valid. By setting wholesale prices at the right level above marginal cost, the supplier can induce retailers to set monopoly prices despite retail competition; the supplier can then use fixed fees to extract retail profits. As we will see, the efficiency result fails to hold when the retailers have bargaining power. While the supplier can act as a "common agent" for the retailers, two-part tariffs do not allow them to coordinate fully their pricing decisions, since each retailer-manufacturer pair has an incentive to free-ride on the other retailer's revenues.

Furthermore, in the context studied by Bernheim and Whinston, or when a single manufacturer offers (public) contracts to competing retailers, two-part tariffs do not need to be contingent on the set of accepted offers to sustain the common agency equilibrium. In contrast, in the setup we consider here, Marx and Shaffer (2004) point out that,

[18] This moreover remains the case when contracts are not publicly observable, contract observability being irrelevant when the manufacturers are the ones that make the offers. If instead the retailer makes take-it-or-leave-it offers, it would require the manufacturers to supply at cost and have no incentive to behave opportunistically (altering one contract cannot hurt the other manufacturer).

with non-contingent contracts, in any common agency equilibrium the joint profits of the manufacturer and a retailer are strictly lower than what they could achieve with exclusive dealing. Indeed, in any candidate common agency equilibrium: (i) the manufacturer must be indifferent between accepting both offers or only one retailer's offer, otherwise that retailer could offer a smaller fixed fee; but (ii) that retailer would be better off if the manufacturer refused its rival's offer, since it would receive or pay the same fee but obtain greater variable profits. The retailer thus has an incentive to deviate to an exclusive dealing situation.[19]

In the remainder of this section, we therefore consider two-part tariffs that are contingent on exclusivity of the form:

$$t_i^k(q) = U_i^k + w_i^k q, \text{ for } q \geq 0 \text{ and } k = C, E\ .$$

We derive a necessary and sufficient condition for the existence of a common agency equilibrium in this context.

Exclusive Dealing

We first note that there always exists an exclusive dealing equilibrium. Clearly, if R_i insists on exclusivity (e.g., by offering only exclusivity, or by degrading its offer for common agency), R_{-i} cannot do better than insisting on exclusivity too. In addition, if M sells at cost exclusively to R_i ($w_i = c, w_{-i} = +\infty$, say), R_i will maximize the pair $M - R_i$'s joint profits, thus generating a total profit equal to Π_i^m. The fixed fee U_i^E can then be used to share these profits as desired. As a result:

Lemma 1 *There always exists an exclusive dealing equilibrium:*

- *If $\Pi_1^m > \Pi_2^m$, in any such equilibrium R_1 is the active retailer while R_2 gets zero profit; among these equilibria, the unique trembling-hand perfect equilibrium, which is also the most favorable to the retailers, yields $\Pi_1^m - \Pi_2^m$ for R_1 and Π_2^m for M.*
- *If $\Pi_1^m = \Pi_2^m$, there exist two exclusive dealing equilibria, where either retailer is active. In both cases, retailers get zero profit and M gets Π_2^m.*

[19] Depending on demand conditions, a standard two-part tariff may suffice to induce exclusivity; otherwise, the contract must include some form of exclusivity provision.

Proof. If one retailer offers only an exclusive dealing contract, the other retailer cannot gain from offering a common agency equilibrium. Hence, without loss of generality we can restrict attention to equilibria in which both retailers only offer exclusive dealing contracts.

In any such equilibrium, the joint profits of the manufacturer and the active retailer, R_i, must be maximized; otherwise R_i could profitably deviate to a different exclusive dealing contract. R_i therefore sets the wholesale price w_i equal to the marginal cost c, and equilibrium industry profits are Π_i^m.

For $\Pi_1^m > \Pi_2^m$, R_2 cannot be an exclusive retailer, since R_1 could outbid any exclusive deal. In addition, R_1's equilibrium fixed fee U_1^E must be in the range $[\Pi_2^m, \Pi_1^m]$: R_2 would outbid R_1's offer if $U_1^E < \Pi_2^m$; and if $U_1^E > \Pi_1^m$, R_1 would be better-off not offering any contract at all. Conversely, any $U_1^E \in [\Pi_2^m, \Pi_1^m]$ can sustain an exclusive dealing equilibrium, in which both retailers offer (only) the same exclusive dealing contract $t_i^E(q) = U_1^E + cq$. The best equilibrium for R_1 (and thus the Pareto-undominated equilibrium for both retailers) is such that $U_1^E = \Pi_2^m$, in which case R_1's payoff is $\Pi_1^m - \Pi_2^m$. In addition, for $U_1^E > \Pi_2^m$, R_2's equilibrium offer is unprofitable and would thus not be made if it could be mistakenly accepted; therefore, such equilibria are not trembling-hand perfect.

For $\Pi_1^m = \Pi_2^m$, the same reasoning implies that exclusive dealing offers must be efficient $\left(w_i^E = c\right)$ and yield exactly Π_2^m to M: it would be unprofitable for the active retailer to offer a higher fixed fee, and its rival could outbid any lower fixed fee. Conversely, it is an equilibrium for both retailers to offer the exclusive dealing contract $t_i^E(q) = \Pi_2^m + cq$. ■

Thus, there always exists an exclusive dealing equilibrium where the more efficient retailer, R_1, outbids its rival and generates the maximal bilateral profit, Π_1^m. When both retailers are equally efficient, standard competition à la Bertrand leaves all the profit to M; otherwise, R_1 can earn up to its contribution to the bilateral profit, $\Pi_1^m - \Pi_2^m$.[20]

Common Agency

For the sake of exposition, we will assume from now on that, for any (w_1, w_2) there is a unique retail equilibrium and we denote the continuation flow profits for R_i, M and the entire industry by $\pi_i(w_1, w_2)$, $\pi_M(w_1, w_2)$ and $\Pi(w_1, w_2)$ respectively.

[20] The situation is formally the same as Bertrand competition between asymmetric firms, where one firm has a lower cost or offers a higher quality.

Unlike under exclusivity, marginal cost pricing cannot implement the monopoly outcome in a common agency situation: if $w_i = c$ for all i, retail competition leads to prices below their monopoly levels. Wholesale prices above cost can, however, be used to offset the impact of retail competition and sustain the monopoly outcome. Indeed, if the equilibrium outcome (quantities or prices for instance) vary continuously as wholesale prices increase, there exist wholesale prices $(\overline{w}_1, \overline{w}_2)$ that sustain the monopoly outcome and thus generate the monopoly profits: $\Pi(\overline{w}_1, \overline{w}_2) = \Pi^m$. Thus, if M could make take-it-or-leave-it offers to the retailers, it would indeed choose these wholesale prices and set fixed fees so as to recover retail margins: in this way, M would generate and appropriate the monopoly profits Π^m.[21] When retailers have the bargaining power, however, the industry monopoly outcome cannot be an equilibrium: while each retailer can internalize any impact of its own price on the profit that M makes on sales (including those to the rival retailer), it still has an incentive to "free-ride" on its rival's downstream margin. Suppose that R_{-i} offers a common agency tariff such that $w^C_{-i} = \overline{w}_{-i}$; offering $w^C_i = \overline{w}_i$ would then maximize industry profits, but not the bilateral joint profits of R_i and M, given by:

$$\pi_i(w_1, w_2) + \pi_M(w_1, w_2) + U^C_{-i} = \Pi(w_1, w_2) + U^C_{-i} - \pi_{-i}(w_1, w_2).$$

Hence, whenever the wholesale price w_i affects the rival retailer's profit, the equilibrium cannot yield the industry monopoly outcome. To fix ideas, we will suppose that a retailer always benefits from an increase in its rival's wholesale price, that is, for $i = 1, 2$:

$$\frac{\partial \pi_{-i}(w_1, w_2)}{\partial w_i} > 0.$$

A simple revealed preference argument then shows that, in response to $w^C_{-i} = \overline{w}_{-i}$, R_i would offer a wholesale price $w^C_i < \overline{w}_i$, adjusting the fixed fee U^C_i so as to absorb any impact on M's profit.

More generally, this reasoning implies that, in any common agency equilibrium, the wholesale price w^C_i must maximize the bilateral profits that R_i can achieve with M, given the wholesale price w^C_{-i}. That is, the equilibrium wholesale prices $\left(w^C_1, w^C_2\right)$ must satisfy:

$$w^C_i = W^{BR}_i(w^C_{-i}), \text{ for } i = 1, 2, \tag{4}$$

[21] This is indeed an equilibrium when contract offers are public. Private offers give M the opportunity to behave opportunistically, which in turn is likely to prevent M from sustaining the monopoly outcome. See Hart and Tirole (1990) and McAfee and Schwartz (1994) for the case of Cournot downstream competition, O'Brien and Shaffer (1992) and Rey and Vergé (2004) for the case of Bertrand competition. Rey and Tirole (2006) offer an overview of this literature.

where the best reply functions $W_i^{BR}(w_{-i})$ is given by:

$$\begin{aligned} W_i^{BR}(w_{-i}) &= \arg\max_{w_i} \{\pi_i(w_1, w_2) + \pi_M(w_1, w_2)\} \\ &= \arg\max_{w_i} \{\Pi(w_1, w_2) - \pi_{-i}(w_1, w_2)\}. \end{aligned}$$

The system (4) has a unique solution in standard cases (e.g., when demand is linear and firms compete in prices or quantities). For the sake of exposition, we will suppose that there exists indeed at least one solution,[22] and denote by $(\widetilde{w}_1, \widetilde{w}_2)$ a solution for which the industry profits are the largest, and by $\widetilde{\Pi} \equiv \Pi(\widetilde{w}_1, \widetilde{w}_2)$ these profits. Since $W_i^{BR}(\overline{w}_{-i}) < \overline{w}_i$, $(\widetilde{w}_1, \widetilde{w}_2) \neq (\overline{w}_1, \overline{w}_2)$ and thus $\widetilde{\Pi} < \Pi^m$.

Two-part tariffs thus cannot implement the industry monopoly outcome: even if common agency arises, contracting externalities prevent the retailers from using the manufacturer as a perfect coordination device. This lack of coordination may in turn prevent common agency from arising in equilibrium. Indeed, from the preliminary analysis in section 3, common agency can prevail only if it generates more profits than exclusive dealing, that is, if:

$$\widetilde{\Pi} \geq \Pi_1^m. \tag{5}$$

Since $\widetilde{\Pi} < \Pi^m$, condition (5) may be violated, in which case common agency cannot arise in equilibrium, even though a fully integrated structure would always opt for it.

Conversely, with contingent tariffs, condition (5) guarantees the existence of a common agency equilibrium in which each R_i earns its contribution to equilibrium profits, $\widetilde{\Pi} - \Pi_{-i}^m$. To see this, suppose that each R_i offers:

- $w_i^C = \widetilde{w}_i$, so that industry profits are equal to $\widetilde{\Pi}$,
- $U_i^C = \pi_i(\widetilde{w}_1, \widetilde{w}_2) - \left[\widetilde{\Pi} - \Pi_{-i}^m\right]$ so that R_i gets its contribution to industry profits, $\pi_i^C = \widetilde{\Pi} - \Pi_{-i}^m \geq 0$, while M gets $\pi_M^C = \Pi_1^m + \Pi_2^m - \widetilde{\Pi} > 0$,
- $w_i^E = c$, so that industry profits would be equal to Π_i^m if this exclusive dealing offer were accepted,
- $U_i^E = \pi_M^C = \Pi_1^m + \Pi_2^m - \widetilde{\Pi}$.

By construction, M earns a positive profit and is indifferent between accepting one or both offers. In addition, wholesale prices are, by definition, such that no retailer can

[22] If this is not the case, there is no common agency equilibrium in pure strategies.

benefit from deviating to another common agency outcome. Finally, it is straightforward to check that no R_i can benefit from deviating to an exclusive dealing arrangement: since M can always secure π_M^C by accepting R_{-i}'s exclusive contract, a deviation to exclusivity cannot give R_i more than:

$$\Pi_i^m - \pi_M^C = \Pi_i^m - \left(\Pi_1^m + \Pi_2^m - \widetilde{\Pi}\right) = \widetilde{\Pi} - \Pi_{-i}^m = \pi_i^C.$$

Note that when this common agency equilibrium exists (that is, when $\widetilde{\Pi} \geq \Pi_i^m$), it is preferred by the retailers to any exclusive dealing equilibrium, and to any other common agency equilibrium since here each retailer gets its full contribution to the industry profits. Finally, in the limit case where $\widetilde{\Pi} = \Pi_1^m$, it is by construction the only possible equilibrium with common agency. The following proposition summarizes this discussion:

Proposition 2 *When contract offers are restricted to two-part tariffs, common agency equilibria exist if and only if* $\widetilde{\Pi} \geq \Pi_1^m$*, in which case:*

- *industry profits are* $\widetilde{\Pi} < \Pi^M$*;*
- *if* $\widetilde{\Pi} > \Pi_1^m$*, both retailers prefer the common agency equilibrium in which each retailer* R_i *earns its contribution to total profits,* $\widetilde{\Pi} - \Pi_{-i}^m$*, while the manufacturer earns* $\Pi_1^m + \Pi_2^m - \widetilde{\Pi}$*, to all other exclusive dealing or common agency equilibria;*
- *if* $\widetilde{\Pi} = \Pi_1^m$*, the unique common agency equilibrium is payoff equivalent to the retailers' preferred exclusive dealing equilibrium.*

Comparison with Bernheim and Whinston (1998)

At this point, it is useful to compare our analysis with Bernheim and Whinston's paper on exclusive dealing. In their model, two manufacturers of imperfect substitutes offer contingent supply contracts to a monopolistic retailer. Focusing on equilibria that are Pareto-undominated from the point of view of the manufacturers on the grounds that the manufacturers are first-movers, they find that the equilibrium market structure is the one that maximizes industry profits, given the profits that each structure can generate (in particular, given the contracting externalities that may prevent achieving monopoly profits under common agency). The same result obtains here: common agency arises in equilibrium (and is then Pareto-undominated for the retailers) if and only if it generates higher profits than the bilateral monopoly profits. Another similarity is that fixed fees are used in both cases to transfer some profits from the retailers to the manufacturer; in particular, they cannot be assimilated with "slotting allowances" to be paid by the manufacturer.

However, in Bernheim and Whinston's model, assuming away agency problems as we do here, under common agency, two-part tariffs (with marginal cost pricing) suffice to achieve the industry monopoly profits: if the other manufacturer prices at marginal cost, the retailer is the residual claimant on all sales of this rival product and the joint profits of a vertical pair thus coincide, up to a constant (the rival's fixed fee), with the industry profits. Hence it is an equilibrium for both manufacturers to set wholesale prices equal to marginal cost, which leads to the maximization of the industry profits. As a result, the manufacturers' preferred equilibrium involves common agency.

The crucial difference in our framework is the role of upstream and downstream market power. In the situation analyzed by Bernheim and Whinston, manufacturers can benefit from the market power of the common agent to align their interests. In contrast, in the situation we analyze here, each retailer has an incentive to free-ride on its rival's downstream margin (which is always positive as long as retailers are imperfect substitutes), and two-part tariffs then fail to sustain the industry monopoly outcome. Common agency is therefore less profitable and, as a result, may not even be sustainable in equilibrium.

5 Conditional Fixed Fees

Standard two-part tariffs thus fail to sustain the monopoly outcome when retailers have the bargaining power but compete against each other. We now show that fixed fees that are *conditional* on buying a strictly positive quantity, can help internalize some of the contracting externalities and allow the parties to sustain higher prices and profits. The basic intuition is that retailers can now protect themselves against aggressive behavior on the downstream market by proposing high conditional fixed fees.

We now consider contracts that are contingent on exclusivity, and where the fixed fees are conditional on trade; tariffs are thus of the form:

$$t_i^k(0) = 0 \text{ and } t_i^k(q) = F_i^k + w_i^k q \text{ for any } q > 0, \qquad (i = 1, 2;\ k = C, E).$$

The marginal price is thus constant except at $q = 0$. Note that retailers' participation constraints are trivially satisfied here, since retailers can avoid any loss by choosing not to buy (and therefore avoid paying the fixed fee) in the last stage.

Exclusive Equilibria

With standard two-part tariffs, the unique trembling-hand perfect exclusive equilibrium, which coincides with the Pareto-undominated (for the retailers) exclusive equilibrium, is such that only the more efficient retailer R_1 is active and earns its contribution to industry profits, $\Pi_1^m - \Pi_2^m$. When fixed fees are conditional, this is the unique exclusive equilibrium; R_2 can indeed secure non-negative profits by not buying in the last stage, and would do so if its contract specified a fixed fee exceeding Π_2^m. Hence, M cannot earn more than Π_2^m by accepting R_2's exclusive offer, and R_1 thus never needs to offer a fixed fee above Π_2^m.

Remark: There can exist "pseudo" common agency equilibria in which M accepts both offers, but eventually only one retailer is active (i.e., buys a positive quantity). However any such common agency equilibrium is outcome equivalent to the unique exclusive equilibrium just described. In what follows, we therefore focus on "proper" common agency equilibria in which both retailers eventually buy positive quantities.

Common Agency Equilibria

Since we consider common agency equilibria where both retailers buy positive quantities, we must have:

$$\pi_i \left(w_1^C, w_2^C \right) \geq F_i^C. \tag{6}$$

If the inequality (6) is strict for R_i, then it still holds for small variations of the rival's wholesale price. Hence, R_{-i} could slightly modify w_{-i}^C in any direction and maintain a common agency outcome, by adjusting F_{-i}^C so as to appropriate any resulting modification in M's profit. To rule out such deviations, w_{-i}^C must maximize (at least locally) the joint profits of M and R_{-i} among (proper) common agency situations, that is, R_{-i} must be on its above-described best reply function: $w_{-i}^C = W_{-i}^{BR}(w_i^C)$.[23]

[23] We assume in this section that the "proper" common agency equilibrium is played whenever it exists, despite the fact that "proper" common agency equilibria may co-exist, for given contract offers, with de facto exclusive equilibria (for example if quantities are strategic substitutes, increasing R_i's quantity may induce R_{-i} to exit, which indeed encourages R_i to expand). This assumption, which is also made for example by Marx and Shaffer (2004), possibly restricts the scope for common agency equilibria since such an equilibrium might be sustained by switching to de facto exclusivity in case of a deviation. The next section shows however that, combined with upfront payments, conditional fixed fees always suffice to sustain common agency and the integrated monopoly outcome.

If the inequality (6) is strict for $i = 1, 2$, both retailers must therefore be on their best reply functions; industry profits are then bounded above by $\widetilde{\Pi}$, and R_i cannot hope to earn more than $\widetilde{\Pi} - \Pi^m_{-i}$. Conversely, it is straightforward to check that, whenever $\widetilde{\Pi} \geq \Pi^m_1$, the previously described equilibrium, where each R_i gets $\widetilde{\Pi} - \Pi^m_{-i}$ and M gets $\Pi^m_1 + \Pi^m_2 - \widetilde{\Pi}$, remains an equilibrium.[24]

We now look for equilibria where (6) is binding for at least one retailer. For expositional purposes, we consider here the case where R_1 is strictly more profitable: $\Pi^m_1 > \Pi^m_2$; we briefly discuss the case $\Pi^m_1 = \Pi^m_2$ at the end of the section.

We first show that (6) cannot be binding for R_1. Indeed, in a common agency equilibrium M must be indifferent between dealing with both retailers or with R_2 only, otherwise R_1 could profitably deviate by slightly lowering its fixed fee F^C_1 (and degrading its exclusive dealing offer): M would still accept both contracts rather than dealing only with R_2, and R_1 would increase its profit. But R_2's exclusive dealing contract cannot offer M more than Π^m_2, otherwise R_2 would rather not buy at the last stage. Therefore, in equilibrium, M cannot earn more than Π^m_2:[25]

$$\pi^C_M \leq \Pi^m_2. \tag{7}$$

In addition, together M and R_1 must still get at least Π^m_1 (otherwise R_1 could profitably deviate):

$$\pi^C_M + \pi^C_1 \geq \Pi^m_1. \tag{8}$$

Summing up (7) and (8) yields:

$$\pi^C_1 \geq \Pi^m_1 - \Pi^m_2 > 0,$$

which implies $\pi_1\left(w^C_1, w^C_2\right) > F^C_1$. Given the above discussion, we must therefore have $w^C_2 = W^{BR}_2(w^C_1)$. As a result, R_1 cannot hope to earn more than $\widehat{\Pi}_1 - \Pi^m_2$, where:

$$\widehat{\Pi}_1 \equiv \max_{w_1} \Pi(w_1, W^{BR}_2(w_1)).$$

Note that $\widehat{\Pi}_1 \in \left]\widetilde{\Pi}, \Pi^m\right[$: (i) since R_2 is on its best reply function and $W^{BR}_2(\overline{w}_1) \neq \overline{w}_2$, $\widehat{\Pi}_1 < \Pi^m$; and (ii) since R_1 maximizes the industry profits rather than the joint profits of the pair $M - R_i$ (keeping in mind that R_2 is on its best reply function), we have $\widehat{\Pi}_1 > \widetilde{\Pi}$.

[24] It suffices to check additionally that a retailer R_i cannot generate higher bilateral profits by deviating to a "pseudo common agency" situation, but this readily follows from the fact that these equilibria are payoff equivalent to exclusive dealing equilibria.

[25] This condition is indeed satisfied in the common agency equilibrium just described, since M then gets $\Pi^m_1 + \Pi^m_2 - \widetilde{\Pi} = \Pi^m_2 - \left(\widetilde{\Pi} - \Pi^m_1\right) \leq \Pi^m_2$.

As before, this common agency situation cannot be an equilibrium if it is less profitable than exclusivity (that is, if $\widehat{\Pi}_1 < \Pi_1^m$). Conversely, we show below that, whenever $\widehat{\Pi}_1 \geq \Pi_1^m$, there exists an equilibrium where (6) is binding for R_2 (and thus R_2 gets zero profit) and R_1 gets $\widehat{\Pi}_1 - \Pi_2^m$.

Proposition 3 *When contract offers are restricted to two-part tariffs with conditional payments, common agency equilibria exist if and only if* $\widehat{\Pi}_1 \geq \Pi_1^m$. *Moreover, if* $\Pi_1^m > \Pi_2^m$, *then:*

- *if* $\widehat{\Pi}_1 \geq \Pi_1^m > \widetilde{\Pi}$, *in any (common agency or exclusive dealing) equilibrium* R_2 *gets zero profit and* M *gets* Π_2^m. *The best equilibrium for* R_1 *(and thus the unique Pareto-undominated equilibrium) involves common agency and gives a profit* $\widehat{\Pi}_1 - \Pi_2^m$ *to* R_1.
- *if* $\widetilde{\Pi} \geq \Pi_1^m$, *there are two Pareto-undominated equilibria for the retailers, which both involve common agency: the equilibrium just described, which yields* $\widehat{\Pi}_1 - \Pi_2^m$ *to* R_1 *and* 0 *to* R_2, *and the equilibrium described in the previous section, which yields a lower profit* $\widetilde{\Pi} - \Pi_2^m$ *to* R_1 *but a positive profit* $\widetilde{\Pi} - \Pi_1^m$ *to* R_2.

Proof. As already noted, the common agency equilibrium studied in the previous section remains an equilibrium when $\widetilde{\Pi} \geq \Pi_1^m$. Suppose now that $\widehat{\Pi}_1 \geq \Pi_1^m$ and consider the following candidate equilibrium:

- $w_1^C = \underset{w_1}{\arg\max}\Pi(w_1, W_2^{BR}(w_1))$ and $w_2^C = W_2^{BR}\left(w_1^C\right)$, so that industry profits are equal to $\widehat{\Pi}_1$,
- F_1^C such that R_1 gets exactly $\pi_1^C = \widehat{\Pi}_1 - \Pi_2^m \geq 0$ and $F_2^C = \pi_2\left(w_1^C, w_2^C\right)$, so that R_2 gets $\pi_2^C = 0$ and M gets $\pi_M^C = \Pi_2^m > 0$,
- for $i = 1, 2$, $w_i^E = c$ and $F_i^E = \pi_M^C = \Pi_2^m$.

By construction, M earns Π_2^m, which it can also secure by opting for either retailer's exclusive dealing offer. Hence any deviation by a retailer R_i must increase the joint profits of M and R_i to be profitable. This cannot be the case for R_2, since: (i) R_2 cannot offer more than $\Pi_2^m = \pi_M^C + \pi_2^C$ through exclusivity (or pseudo-common agency); and (ii) given

w_1^C, R_2's wholesale price w_2 already maximizes the joint bilateral profit among common agency situations.[26]

Similarly, R_1 cannot increase its joint profits with M by deviating to exclusivity or pseudo common agency, since this would generate at most $\Pi_1^m \leq \widehat{\Pi}_1 = \pi_M^C + \pi_1^C$. Moreover, R_1 cannot profitably deviate to another proper common agency outcome either, since w_1^C maximizes the joint profits with M, under the constraint that R_2 remains active. The above contracts thus constitute an equilibrium.

When $\widehat{\Pi}_1 \geq \Pi_1^m > \widetilde{\Pi}$, there exists no common agency equilibrium where condition (6) is strictly satisfied for both retailers, since in any such candidate equilibrium industry profits are bounded above by $\widetilde{\Pi}$ and would therefore not survive deviations to exclusive dealing. The only common agency equilibria are thus such that R_2 gets 0 and R_1 gets at most $\widehat{\Pi}_1 - \Pi_2^m$. All other equilibria are such that R_2 is inactive and thus gets again 0, while M gets Π_2^m and R_1 gets $\Pi_1^m - \Pi_2^m$. Hence the common agency equilibrium where R_1 gets $\widehat{\Pi}_1 - \Pi_2^m$ is the unique Pareto-undominated equilibrium.

When $\widetilde{\Pi} \geq \Pi_1^m$, in addition to the equilibria just mentioned there also exists common agency equilibria where conditions (6) are strictly satisfied for both retailers, and in the best of these equilibria for the retailers each R_i gets $\widetilde{\Pi} - \Pi_{-i}^m$. The conclusion follows. ■

Conditional payments thus increase the scope for common agency: with unconditional fixed fees, common agency equilibria exist only when $\widetilde{\Pi} \geq \Pi_1^m$, while with conditional payments they exist whenever $\widehat{\Pi}_1 \geq \Pi_1^m$, where by construction $\widehat{\Pi}_1 > \widetilde{\Pi}$. In the additional common agency equilibria, however, the less profitable retailer gets zero profit; hence when $\widetilde{\Pi} \geq \Pi_1^m$, the retailers may disagree over the equilibrium selection: the more profitable retailer would rather opt for the new "asymmetric" equilibrium, while the other retailer would favor the previous, more balanced equilibrium.

Finally, it is straightforward to check that, when the two retailers are equally profitable ($\Pi_1^m = \Pi_2^m$), there exist two types of asymmetric equilibria, in which either retailer R_i gets up to $\widehat{\Pi}_i - \Pi_{-i}^m$, where $\widehat{\Pi}_1$ is defined as above and $\widehat{\Pi}_2 \equiv \max_{w_2} \Pi(W_1^{BR}(w_2), w_2)$, while the other retailer gets zero profit.

Note that, as in the previous section, (conditional) fixed fees are again used to transfer some profits from the retailers to the manufacturer, and thus cannot be assimilated with

[26] More precisely, w_2^C maximizes the joint profit of M and R_2 among those situations, even when ignoring the constraint that R_1 must remain active, and this constraint is indeed satisfied for w_2^C; w_2^C therefore also maximizes these profits when taking the constraint into account.

slotting allowances.

Remark: As long as contracts are observed before retailers actually compete, conditional payments would also solve the problem of opportunism in the framework of Hart and Tirole (1990), where a monopolist manufacturer makes unobservable offers to competing retailers: since conditional fixed fees give retailers the opportunity to "exit" later on, retailers are willing to accept high (conditional) fixed fees, even if they do not observe the offer made to their rivals.

6 Three-part Tariffs

We now consider "three-part tariffs" that combine classic two-part tariffs with conditional fixed payments; tariffs are thus of the form:

$$t_i^k(q_i) = \begin{cases} U_i^k & \text{if } q_i = 0 \\ U_i^k + F_i^k + w_i^k q_i & \text{if } q_i > 0 \end{cases} \quad (i = 1, 2;\ k = C, E).$$

We now show that these tariffs can implement the industry monopoly profits Π^m, and allow each retailer R_i to earn its full contribution to the industry profits, $\Pi^m - \Pi^m_{-i}$. To see this, consider the following contracts: for $i = 1, 2$,

- $U_i^C = -\left[\Pi^m - \Pi^m_{-i}\right] < 0$, so that retailers get their contributions to the industry profits through the upfront payments,
- $w_i^C = \overline{w}_i$, so that wholesale prices sustain the monopoly prices and quantities,
- $F_i^C = \pi_i(\overline{w}_1, \overline{w}_2)$, so that M recovers ex post all retail margins and thus gets $\Pi_1^m + \Pi_2^m - \Pi^m$,
- $w_i^E = c$ and $F_i^E + U_i^E = \Pi_1^m + \Pi_2^m - \Pi^m$, so that M can secure as well its equilibrium profit by dealing exclusively with either retailer.[27]

M is willing to accept both contracts (it earns the same positive profit by accepting either one or both offers), and accepting both contracts induces the retailers to implement the monopoly outcome: since conditional payments are just equal to each retailer's variable profits when both retailers are active, each retailer is willing to sell a positive

[27] It does not matter whether fixed fees are upfront or conditional in the exclusive dealing offers, since the retailer always finds it profitable to sell a positive quantity.

quantity, in which case wholesale prices lead to the monopoly outcome. Finally, the slotting allowances are designed so as to give each retailer its contribution to the joint profits.

Therefore, if both contracts are proposed, they are accepted by M and yield the desired monopoly outcome. We now check that no retailer has an incentive to offer any alternative contract (even outside the particular class of three-part tariffs).

By construction, M can get its equilibrium profit π_M^C by opting as well for either retailer's exclusive offer; therefore, in order to benefit from a deviation, R_i must increase its joint profits with M. Since in equilibrium these are equal to:

$$\Pi_1^m + \Pi_2^m - \Pi^m - \left(\Pi^m - \Pi_{-i}^m\right) = \Pi_i^m,$$

R_i cannot lure M into a more profitable exclusive dealing arrangement. And given the contract offered by R_{-i}, bilateral profits cannot be higher than Π_i^m in any (pseudo or proper) common agency situation +3either:

- Total industry profits cannot exceed Π^m.
- Since R_{-i} can always choose not to sell in the last stage, R_{-i}'s overall profit cannot be lower than its slotting allowance $\Pi^m - \Pi_i^m$.
- Hence, the joint profits of M and R_i cannot exceed $\Pi^m - (\Pi^m - \Pi_i^m) = \Pi_i^m$.

The above contracts thus constitute a common agency equilibrium where each retailer R_i earns the maximal achievable profit, $\Pi^m - \Pi_{-i}^m$. Both retailers therefore prefer this equilibrium to any other exclusive dealing or common agency equilibrium. The following proposition summarizes this discussion:

Proposition 4 *When retailers can offer three-part tariffs or more general contracts, common agency equilibria exist in which industry profits are at the monopoly level, and each retailer earns its full contribution to these profits.*

Out of all (exclusive dealing and common agency) equilibria, the retailers prefer such a common agency equilibrium. This can be sustained by three-part tariffs where M pays an initial slotting allowance of $\Pi^m - \Pi_{-i}^m$ to each retailer R_i, and then receives R_i's variable profit $\pi_i^C(\overline{w}_1, \overline{w}_2)$ as a conditional fixed fee.

Conditional payments can hence be used as a commitment to maintain high prices; indeed, if a retailer tries to undercut its rival, this will induce the rival to "opt out" and waive the conditional payment to the manufacturer. This generates a loss for M that needs to be compensated, which in turn reduces the profitability of any such deviation. In the limit, conditional payments equal to the profits that retailers expect to achieve ex post can sustain the desired outcome. Upfront payments by the manufacturer can then be used to share the profits with the retailers.

Hence, retailers can sustain the monopoly outcome through three-part tariffs that combine both initial and conditional fixed fees. To rule out opportunistic moves, however, the conditional fixed fees must be large (the ones that are exhibited extract all of the retailers' variable profits). Therefore, to get their share of the profit, retailers must receive down payments from the manufacturer, i.e. $U_i < 0$.[28] Proposition 4 thus shows how slotting allowances or other forms of down payments can contribute to eliminate competition.

Conversely, if payments by the manufacturer were forbidden, three-part tariffs would yield the same equilibrium outcomes as (conditional) two-part tariffs. Indeed, a retailer can always do at least as well by using conditional fees only: conditional fees are used by a retailer to prevent its rival to deviate and offer a free-ride on its sales by threatening to "quit." By splitting the total fee into an unconditional and a conditional parts, the retailer will only make the threat weaker without chances to increase its profit. Therefore, choosing $U_i^C = 0$ is a (weakly) dominant strategy.

We have focused here on three-part tariffs but other payment schemes could achieve the same effects:

- A non-linear tariff of the form $T_i\left(q_i\right) = \left(P_i\left(q_i, q_{-i}^m\right) - c\right) q_i + U_i$, where q_{-i}^m denotes R_{-i}'s monopoly quantity and $U_i \leq 0$ represents an upfront payment by the manufacturer, would also work: any attempt to undercut R_i would induce it not to buy, and upfront payments can again be used to share the overall profits.

- A more radical solution would consist in "selling" to the manufacturer the right to determine the tariffs.

[28] In principle, three-part tariffs can sustain equilibria in which the manufacturer obtains up to all of the industry profits, in which case upfront payments are equal to 0. However, these equilibria rely on unprofitable exclusive dealing options, and therefore are not trembling-hand perfect.

- "Classic" two-part tariffs combined with resale price maintenance would also yield the monopoly outcome: the retailers would then offer contracts in which the wholesale and (imposed) retail prices are equal to monopoly price $\left(w_i = p_i = P_i\left(q_i^m, q_{-i}^m\right)\right)$. This would prevent each pair $M - R_i$ from free-riding on R_{-i}'s retail margin. In this way, the manufacturer recovers all the industry profits, which can be redistributed through upfront payments.

Note that these alternative solutions all involve down payments by the manufacturer to the retailers.[29]

7 Discussion

7.1 Link with the literature

Our results differ from those obtained in the literature on bilateral contracting with externalities such as Martimort and Stole (2003) or Segal and Whinston (2003): whereas externalities always generate the inefficient outcome for the firms in their settings, we find that three-part tariffs can be used to generate the monopoly outcome. The key idea is the following.[30] In bidding games in which the downstream firms offer non-linear contracts to the supplier, who then chooses the quantities to procure, the negotiation over $T_i(.)$ has no effect on q_{-i} when the supplier's cost function is separable in q_1 and q_2. Therefore, when negotiating $T_i(.)$, M and R_i maximize their joint profits, taking q_{-i} as given, and the outcome is necessarily inefficient from the point of view of the fully integrated structure.[31]

[29] An even more radical solution would be to allow R_i's offer to be contingent on the terms of M's contract with R_{-i} (or simply on the quantity q_{-i}). However, this type of contract contravenes competition laws since it can be seen as an horizontal agreement rather than as a purely vertical contract.

[30] We thank Mike Whinston for useful comments that provided the basis for the following discussion.

[31] Having accepted the tariffs T_1 and T_2, the supplier chooses how much to procure so as to maximize its profit, that is:

$$\left(q_1^R\left(T_1, T_2\right), q_2^R\left(T_1, T_2\right)\right) = \underset{(q_1, q_2)}{\arg\max}\left[T_1\left(q_1\right) + T_2\left(q_2\right) - C\left(q_1, q_2\right)\right].$$

Therefore, if the cost function is separable in q_1 and q_2 (i.e. $C\left(q_1, q_2\right) = C_1\left(q_1\right) + C_2\left(q_2\right)$), each quantity q_i^R is indeed independent of T_{-i}, that is, $q_i^R\left(T_1, T_2\right) = q_i^R\left(T_i\right)$. Given the equilibrium tariff offered by R_{-i}, and therefore given the equilibrium quantity q_{-i}^*, R_i offers a tariff T_i that induces M to choose q_i so as to maximize the joint profits of the pair $M - R_i$, equal to:

$$P_i\left(q_i, q_{-i}^*\right) q_i - C_i\left(q_i\right) + T_{-i}\left(q_{-i}^*\right) - C_{-i}\left(q_{-i}^*\right).$$

In our framework, downstream prices and quantities are determined by the retailer. Therefore, R_{-i}'s behavior responds to R_i's contract; however, as long as this response is smooth, the outcome will still be inefficient. Suppose for instance that retailers compete in quantities and let $\rho_i(q_i, q_{-i}) = P_i(q_i, q_{-i})\, q_i$ denote the revenue generated by R_i's quantity; assuming that R_{-i}'s reaction function $q_{-i}^{BR}(q_i)$ is differentiable, consider the impact of a change in q_i on the joint profits π_{M-R_i} of the pair $M - R_i$:

$$\frac{\partial \pi_{M-R_i}}{\partial q_i} = \frac{\partial \rho_i}{\partial q_i} - c + \left(\frac{\partial \rho_i}{\partial q_{-i}} - c + \frac{dT_{-i}}{dq_{-i}}\right)\frac{dq_{-i}^{BR}}{dq_i}.$$

Given that q_{-i} has been chosen optimally by R_{-i}, we have:

$$\frac{dT_{-i}}{dq_{-i}} = \frac{\partial \rho_{-i}}{\partial q_{-i}},$$

and therefore:

$$\frac{\partial \pi_{M-R_i}}{\partial q_i} = \frac{\partial \rho_i}{\partial q_i} - c + \left(\frac{\partial \rho_i}{\partial q_{-i}} + \frac{\partial \rho_{-i}}{\partial q_{-i}} - c\right)\frac{dq_{-i}^{BR}}{dq_i}.$$

The monopoly quantities $\left(q_i^m, q_{-i}^m\right)$, however, solve the equations:

$$\frac{\partial \rho_i}{\partial q_i} + \frac{\partial \rho_{-i}}{\partial q_i} - c = 0, \text{ for } i = 1, 2,$$

and thus:

$$\left.\frac{\partial \pi_{M-R_i}}{\partial q_i}\right|_{\left(q_i^m, q_{-i}^m\right)} = -\frac{\partial \rho_{-i}}{\partial q_i} \neq 0.$$

Therefore, the equilibrium tariffs cannot induce the monopoly outcome, since the quantity q_i^m would not maximize the joint profits of the pair $M - R_i$.

In order to generate the efficient outcome (from the firms' point of view), a small change in R_i's contract must thus induce a *"large"* (i.e. discontinuous) change in R_{-i}'s behavior. This can easily be achieved in our framework by setting the conditional fixed fee F_i equal to the retail profit generated on product i, so that R_i's profit (gross of the upfront payment) is zero in equilibrium. In this case, whenever the pair $M - R_i$ tries to free-ride on R_{-i}'s sales, R_{-i} opts out (i.e., q_{-i}^{BR} drops to zero), which causes a sharp

The equilibrium quantities are thus given by:

$$P_i\left(q_i^*, q_{-i}^*\right) - C_i'\left(q_i^*\right) = -\frac{\partial P_i}{\partial q_i},$$

which implies $\left(q_i^*, q_{-i}^*\right) \neq \left(q_i^m, q_{-i}^m\right)$.

Note that congestion problems or other negative externalities, leading to $C(q_1, q_2)$ with $\frac{\partial^2 C}{\partial q_1 \partial q_2} > 0$, would typically exacerbate the inefficiency by giving each pair $M - R_i$ an additional incentive to expand its quantity q_i, in order to induce R_{-i} to reduce its own quantity q_{-i}.

decrease in the joint profits of the pair $M - R_i$ and makes any such deviation unprofitable. The lump-sum "slotting allowances" (upfront payments U_i) can then be used to share the surplus with the retailers.

Our results also differ strikingly from those obtained by Marx and Shaffer (2004) who look at the same situation but with non-contingent contracts. In their case, slotting allowances are exclusionary and occur only when the two retailers are asymmetric. If, as in this paper, the terms of the contracts can depend upon the market configuration (exclusive dealing or common agency), slotting allowances guarantee instead that both retailers are active and allow them to eliminate retail competition and maintain monopoly prices. Moreover, even equally profitable retailers demand slotting allowances.

To understand why contingency is essential, suppose that the retailers offer non-contingent three-part tariffs that correspond to our equilibrium common agency tariffs. With non-contingent contracts, all fixed payments are the same whether the manufacturer accepts one or both offers (in particular, in both cases, the retailer will choose a positive quantity and thus pays the conditional fixed fee), so that only variable profits are altered. In order to sustain a common agency equilibrium, these variable profits must be the same for the manufacturer; otherwise, either the manufacturer would opt for exclusive dealing, or at least one retailer could ask for a larger upfront payment without affecting the continuation equilibrium. Since the retailer's variable profit increases in case of exclusivity, there is a profitable deviation to exclusivity. With contingent contracts, however, the fixed fee (and/or the upfront payment) can be adjusted in case of exclusivity, so that the retailer can maintain the manufacturer's overall profit by giving back, through a higher fee, its own increase in variable profit.

Thus, contingent offers, which we view as a convenient short-cut for reflecting the renegotiation that changes in market structure would likely trigger, help limit the scope for profitable deviations from a common agency situation and thus contribute to make such situations more stable. We suspect that the same insight would carry over to situations where multiple manufacturers deal with multiple retailers.[32]

[32] Rey and Vergé (2002) study the case where two manufacturers deal with two retailers. They show that, with non-contingent two-part tariffs, it can be the case that no equilibrium exists where all "channels" are active, even in situations where each channel could contribute to enhance industry profits. The analysis of the present paper suggests that allowing for contracts contingent on the market structure (i.e., on which channels are active) may restore the existence of "double common agency" equilibria.

7.2 Policy Implications

We now use our analysis to assess the impact of slotting allowances on prices and welfare. Slotting allowances allow the firms to eliminate competition and sustain the monopoly profits, and retailers can clearly benefit from this: (i) they can never get more than their contribution to industry profits; and (ii) with slotting allowances, they can get their full contribution to the industry monopoly profits. We now consider the impact of slotting allowances on the manufacturer, consumers and total welfare; for the sake of exposition, we will focus on equilibria that Pareto-undominated for the retailers.[33]

When slotting allowances or down payments by the manufacturer are allowed, the retailers do get their full contribution to the monopoly profits, leaving $\Pi_1^m + \Pi_2^m - \Pi^m$ to the manufacturer. When instead slotting allowances or down payments by the manufacturer are forbidden, the equilibria that are Pareto-undominated for the retailers leave either Π_2^m or (provided that $\widetilde{\Pi} \geq \Pi_1^m$) $\Pi_1^m + \Pi_2^m - \widetilde{\Pi}$ to the manufacturer. Slotting allowances thus unambiguously reduce the manufacturer's profit:

$$\Pi_1^m + \Pi_2^m - \Pi^m = \Pi_2^m - (\Pi^m - \Pi_1^m) < \Pi_2^m - \max\left[0, \widetilde{\Pi} - \Pi_1^m\right].$$

Therefore, while the retailers would be willing to use slotting allowances, the manufacturer might object to such a move.

The impact of slotting allowances on consumer surplus and total welfare is a priori more ambiguous. More precisely:

- When slotting allowances are allowed, the unique Pareto-undominated equilibrium for the retailers, which we will denote by $\mathcal{E}^m$, yields the monopoly outcome: both prices are at the industry monopoly level.
- If instead slotting allowances are not allowed, the equilibria are the same as those described in Propositions 2 and 3 (see the discussion following Proposition 4); therefore:[34]

[33] The comparison might otherwise be less meaningful. In particular, the class of contracts that are considered does not affect the manufacturer's preferred (trembling-hand perfect) equilibrium, since: (*i*) the manufacturer can always get Π_2^m in an exclusive dealing equilibrium; (*ii*) in any common agency equilibrium, the manufacturer must be indifferent between accepting both offers or only R_2's exclusive dealing offer; and (*iii*) in any trembling-hand perfect equilibrium, R_2 cannot offer an exclusive dealing contract that gives more than Π_2^m to the manufacturer.

[34] For the sake of exposition, we assume here $\Pi_1^m > \Pi_2^m$; the discussion of the case $\Pi_1^m = \Pi_2^m$ can easily be adapted.

– when $\Pi_1^m > \widehat{\Pi}_1$, the unique Pareto-undominated equilibrium for the retailers, which we will denote by $\mathcal{E}_1^m$, is such that only the more efficient retailer, R_1, is active, and retail prices correspond to the bilateral monopoly outcome. Consumers and society favor $\mathcal{E}^m$ to $\mathcal{E}_1^m$ since both prices are higher in the latter case (this is the case at least when prices are strategic complements).

– when $\widehat{\Pi}_1 \geq \Pi_1^m > \widetilde{\Pi}$, the unique Pareto-undominated equilibrium for the retailers, which we will denote by $\widehat{\mathcal{E}}$, is such that both retailers are active and both wholesale prices are on the best-responses: $\widetilde{w}_1 = W_i^{BR}(\widetilde{w}_2), \widetilde{w}_2 = W_2^{BR}(\widetilde{w}_1)$.

– when $\widetilde{\Pi} \geq \Pi_1^m$, besides $\widehat{\mathcal{E}}$ there exists another Pareto-undominated equilibrium for the retailers, which we will denote by $\widetilde{\mathcal{E}}$ and is such that both retailers are active, but R_2 is on its best response: $\widehat{w}_2 = W_2^{BR}(\widehat{w}_1)$, whereas $\widehat{w}_1$ maximizes the industry profits along that best response: $\widehat{w}_1 = \arg\max_{w_1} \Pi\left(w_1, W_2^{BR}(w_1)\right)$.

Banning slotting allowances may thus either lead to exclusive dealing (when $\Pi_1^m > \widehat{\Pi}_1$) or lead to a common agency equilibrium ($\widehat{\mathcal{E}}$ if $\widetilde{\Pi} < \Pi_1^m \leq \widehat{\Pi}_1$ and either $\widehat{\mathcal{E}}$ or $\widetilde{\mathcal{E}}$ if $\widetilde{\Pi} \geq \Pi_1^m$) where prices can possibly be lower than the monopoly level. Prices are for example indeed lower in $\widetilde{\mathcal{E}}$ when wholesale prices are strategic complements (i.e., $\left(W_i^{BR}\right)' > 0$), the wholesale price equilibrium $\widetilde{\mathcal{E}}$ is "stable" (i.e., $\left(W_1^{BR}\right)' \left(W_2^{BR}\right)' < 1$), and an increase in either wholesale price increases both retail prices and reduces both retail quantities.[35] The welfare implications of banning slotting allowances are thus a priori ambiguous. On the one hand, if both retailers were to carry the manufacturer's product anyway, slotting allowances can be used to *reduce competition*, thus harming consumers and reducing total welfare. On the other hand, slotting allowances can avoid the complete *elimination of a competitor*, in which case they are socially desirable.

To investigate further the desirability of banning slotting allowances, it is therefore necessary to identify factors that influence whether exclusion is likely or not, which hinges on the comparison between $\widehat{\Pi}_1$ and $\widetilde{\Pi}$, on the one hand, and Π_1^m, on the other hand. Let us first compare compare $\widetilde{\Pi}$ and Π_1^m. One would expect $\widetilde{\Pi}$ to be higher than Π_1^m when the retailers are highly differentiated. Indeed, if the retailers are selling on independent

[35] In $\widetilde{\mathcal{E}}$ each retailer R_i free-rides on its rival's downstream margin, leading to a wholesale price $w_i = W_i^{BR}(w_{-i})$ lower than what would maximize the industry profit; as a result, the equilibrium wholesale prices lie below the levels that would sustain the monopoly outcome (i.e., $\widetilde{w}_i < w_i^M$), leading to retail prices that are also lower than the monopoly level.

markets, $\Pi^m = \Pi_1^m + \Pi_2^m$ and, in addition, the pair $M - R_i$ no longer has an incentive to free-ride on R_{-i}'s sales, so that the common agency profit is equal to the monopoly profit: $\widetilde{\Pi} = \Pi^m$; therefore, $\Pi_1^m < \widetilde{\Pi}$, implying that both retailers would be active even with classic two-part tariffs. If instead retailers are perfect substitutes, $\Pi^m = \Pi_1^m$ while $\widetilde{\Pi} < \Pi^m$. In this case, exclusive dealing occurs when contracts are limited to classic two-part tariffs, implying that $\widetilde{\mathcal{E}}$ cannot be the outcome when slotting allowances are banned. Classic two-part tariffs are therefore more likely to generate exclusive dealing equilibria when products are less differentiated.

A similar analysis can be made with the relative asymmetry of the retailers: for a given level of substitutability between retailers, the inequality $\widetilde{\Pi} < \Pi_1^m$ is more likely to hold when one retailer contributes much more than the other to the industry profit (that is, Π_1^m close to Π^m); thus, ceteris paribus, symmetry therefore makes common agency equilibria more likely.

With conditional payments, Pareto-undominated common agency equilibria exist more often since $\widehat{\Pi}_1 > \widetilde{\Pi}$. However, it remains the case that lower degrees of substitution or more asymmetry make it more likely that common agency equilibria fail to exist. When the retailers become more asymmetric, Π_1^m gets indeed closer to Π^m, making the inequality $\widetilde{\Pi} < \Pi_1^m$ is more likely to hold.

In order to explore this question further, we now consider linear inverse demand functions given by:

$$P_1(q_1, q_2) = 1 - \frac{(1-\alpha)\, q_1 - \sigma q_2}{1-\sigma} \text{ and } P_2(p_1, p_2) = 1 - \frac{(1+\alpha)\, q_2 - \sigma q_1}{1-\sigma},$$

where $\alpha, \sigma \in [0, 1[$ and $\alpha + \sigma < 1$, and normalize the production cost to $c = 0$. The parameter α measures the asymmetry between the two retailers (retailers are equally profitable when $\alpha = 0$) while σ represents the degree of substitutability between the retailers (the markets are independent when $\sigma = 0$ while the two retailers become less and less differentiated as σ increases). The condition $\alpha + \sigma < 1$ ensures that both retailers are needed to maximize industry profits (i.e., that the industry monopoly outcome involves a positive quantity for R_2).

The results obtained with this specification are illustrated in figures 1 and 2. Figure 1 shows the range of parameter values for which common agency equilibria exist when slotting allowances are banned, both in the quantity (bold lines) and price (dashed lines) competition cases. Figures 2 show the impact of banning slotting allowances on consumer surplus (in the case of quantity competition, to fix ideas, but results are similar for price

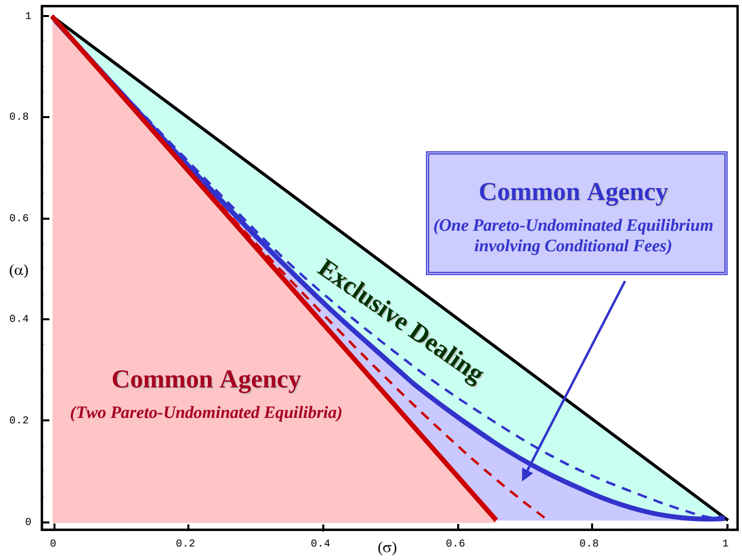
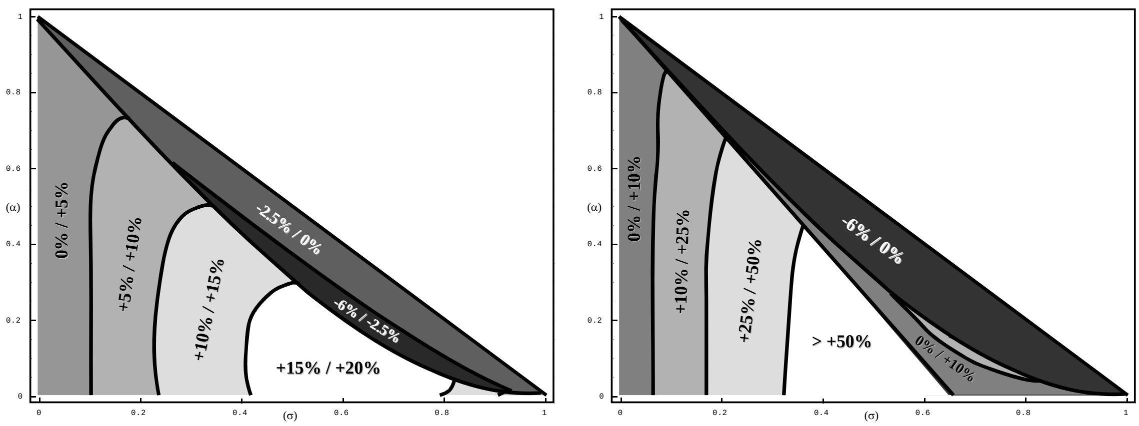


Figure 1: Pareto-undominated equilibrium outcomes when slotting allowances are banned

competition): figure (i) (resp. (ii)) is drawn for the "worst" (resp. "best") case scenario, that is, selecting the worst (best) equilibrium from the consumer point of view – $\widehat{\mathcal{E}}$ (resp. $\widetilde{\mathcal{E}}$) – when $\widehat{\mathcal{E}}$ and $\widetilde{\mathcal{E}}$ co-exist (i.e., for low values of σ and α).



(i) $\widehat{\mathcal{E}}$ selected (ii) $\widetilde{\mathcal{E}}$ selected

Figure 2: Impact of banning slotting allowances on consumer surplus

The analysis of this example first confirms that, absent slotting allowances or other types of down payments by the manufacturer, exclusion is more likely to occur when retailers are good substitutes and/or rather asymmetric (high values of σ and/or α). But these are also the situations where exclusion is socially less costly, since little is lost when the excluded retailer would not add much value to the already active one. The positive effects of a ban on slotting allowances thus appear here likely to be larger than its negative effects.

Finally we can note from figure 1 that, absent slotting allowances, both retailers are more likely to be active when they compete in prices rather than in quantities. Retailers' compete more aggressively when they choose prices rather quantities; thus, price competition results in lower retail margins. This in turn reduces each $M-R_i$ pair's incentives to free-ride on the rival's sales and leads to a higher value for the candidate common agency equilibrium profit (i.e. either $\widehat{\Pi}_1$ or $\widetilde{\Pi}$), which reduces the likelihood of exclusion.

8 Conclusion

This paper examines the role that upfront payments and conditional fixed fees play in determining the market structure and retail prices. We first show that with classic two-part tariffs that contain an upfront fixed fee, a common agency structure cannot sustain the industry monopoly outcome. This implies that the less efficient retailer may be excluded in equilibrium. We also show that conditional fixed fees permit firms to maintain higher common agency profits, by serving as a commitment to opt out of the market in case prices are low; this expands the scope for common agency, although the less efficient retailer gets zero profit in the additional common agency equilibria.

Finally, combining conditional fixed fees with slotting allowances suffices to sustain the industry monopoly outcome. This result is robust; in particular, it does not depend on the type of retail competition (e.g. prices vs. quantities), nor on the extent to which retailers are differentiated. Even when they are close substitutes, the retailers can commit to maintain monopoly prices (through adequate wholesale prices) by offering conditional fixed fees equal to their anticipated profits, and can then use slotting allowances to recover from the manufacturer their contribution to the monopoly profits. In the absence of any restriction on the tariffs, it is optimal for the retailers to combine in this way slotting allowances and conditional fixed fees in order to induce common agency and monopoly prices.

The welfare implications of banning slotting allowances are more ambiguous. Slotting allowances may avoid the exclusion of retailers but also eliminate any effective competition between them. Relevant factors in assessing the implications in a given market include such characteristics as the degree of substitutability and the symmetry among the retailers. We find that slotting allowances are most likely to be detrimental to welfare when retailers are not too close substitutes and rather symmetric.

As mentioned earlier, three-part tariffs are not the only way to achieve the monopoly outcome. More general non-linear tariffs or even two-part tariffs combined with resale price maintenance could also generate a similar outcome. However, they all involve down payments ("slotting allowances") by the manufacturer to the retailers.

Our analysis also highlights the role of bargaining power. As mentioned earlier, much of the literature on vertical contracting assumes that the bargaining power rests upstream. Yet, the bargaining power has often shifted towards large retailers in recent years. Empirical evidence indicates that the strong position of the retailers is positively correlated with both the incidence and the magnitude of slotting allowances. Our analysis confirms this observation. Were bargaining power upstream, the industry monopoly outcome could be achieved without slotting allowances; classic two-part tariffs, with positive fixed fees, would suffice. Once retailers have some bargaining power, however, upfront payments by the manufacturer are necessary to maintain monopoly prices.

In our analysis, where retailers can offer tariffs that are contingent on exclusivity, slotting allowances always arise in the retailers' preferred equilibrium, and this equilibrium always involves common agency. In contrast, in Marx and Shaffer (2004) where contracts are non-contingent, upfront payments always lead to exclusion and they only arise when retailers are asymmetric.

An interesting extension would be to allow for less extreme bargaining power. While it is easy to check that three-part tariffs keep implementing the monopoly outcome for any degree of bargaining power (with upfront payments that increase with the retailers' bargaining power), the equilibrium that would arise with only upfront or conditional payments still needs to be explored.

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