Slotting Allowances and Conditional Payments*

Patrick Rey† Jeanine Thal‡ Thibaud Vergé§

July 27, 2006

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 (1985, 1998), who study the situation in which competing manufacturers offer contracts to a common retailer, we find that two-part tariffs (even if contingent on exclusivity or not) do not suffice to implement the monopoly outcome. More complex arrangements are required to internalize all the contracting externalities. The retailers can for example achieve the monopoly outcome through (contingent) three-part tariffs that combine slotting allowances (i.e., upfront payments by the manufacturer) with two-part tariffs where the fees are conditional on actual trade. 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 maintain monopoly prices in a common agency situation. Simulations suggest that the latter effect is more significant.

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

JEL classification codes: L14, L42.

*We would like to thank Mike Whinston, David McAdams, Lucy White and participants at the 3^{rd} International Industrial Organization Conference (Atlanta), ESSET 2005 (Gerzensee), CEPR Competition Policy and International Trade Conference (Brussels), 7^{th} INRA-IDEI Conference on "Industrial Organization and the Agro-Food Industry"(Toulouse) and seminars at Mannheim, University of East Anglia, CREST-LEI and Toulouse for useful comments.

†University of Toulouse (IDEI and GREMAQ), prey@cict.fr

‡CREST–LEI and University of Toulouse (GREMAQ), JeanineThal@gmail.com

§CREST–LEI, thibaud.verge@ensae.fr

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 (sometimes 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,[2] listing or pay-to-stay fees are particularly contentious.[3] In the UK for example, where 58 percent of large suppliers reported in 2000 that major supermarket chains requested listing fees,[4]

[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).

[3] Fees related to promotional activities can be a way to compensate a retailer for additional effort (see e.g. Klein-Wright (2006)). Fees related to the introduction of a new product may serve risk-sharing, signaling or screening purposes (see Kelly (1991)).

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

the supermarkets code of practice introduced in 2001 prohibits lump sum fees not related to promotional activities or to the introduction of a new product (a recent report shows, however, that listing fees continue to be common).[5]

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.[6] 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. In contrast, the business of a leading manufacturer usually represents a very small proportion of business for each of the major multiples. Finally, 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.[7]

Real-world evidence indicates that both the incidence and the magnitude of slotting allowances are associated with the exercise of retail bargaining power.[8] To capture this idea, Marx and Shaffer (2004) consider a model of vertical negotiations where retailers have the initiative and show that strong retailers can exclude other retailers by offering "three-part tariffs" that include 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 in fact use upfront payments and conditional fixed fees to achieve monopoly profits when distributing the good of a common supplier. As in Marx and Shaffer (2004), we consider a situation where rival, differentiated retailers offer public take-it-or-leave-it contracts to a single manufacturer; however, we allow contracts to be contingent on whether the retailer gets exclusivity or

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

[6] See Inderst and Wey (2006) for more evidence on the retailers' growing bargaining power in different sectors both in Europe and in the US.

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

[8] 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.*"

not. This assumption can be motivated in two ways. First, one might indeed expect firms to discuss what would be the terms for both options. Second, even when firms negotiate a non-contingent contract, they do so with a given market configuration in mind, and would probably renegotiate the terms of the contract if the actual configuration turned out not to be as expected.[9] We study in this context 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 when both retailers distribute the good. We show that there exist equilibria where firms achieve the integrated monopoly outcome, and that the retailers' preferred equilibrium gives each retailer its entire contribution to the industry monopoly profits.

If it had the bargaining power, the manufacturer could sustain the industry monopoly outcome even without slotting allowances or conditional fees: it could simply offset the competitive pressure on retail prices by charging wholesale prices above costs, so as to maintain consumer prices at the monopoly level, and recover any remaining retail profit through fixed fees. When the retailers have the initiative, however, standard two-part tariffs no longer yield monopoly prices and profits when both retailers are active, since each retailer then has an incentive to free-ride on its rival's revenue by reducing its own price. By reducing the profits that can be achieved, this free-riding may moreover lead to the exclusion of a retailer.

In this context, conditioning fixed fees on actual trade contributes to protect retailers against such free-riding, since they can then "opt out" and waive the fixed fee if a rival tries to undercut them. Combined with upfront payments by the manufacturer, conditional fixed fees then allow retailers to be both active and achieve the industry monopoly profits: wholesale prices above costs maintain retail prices at the monopoly level, while large conditional payments (up to the retailers' anticipated variable profits) protect retailers against any opportunistic move by their rivals. Upfront payments by the manufacturer can then be used to give ex ante each retailer its contribution to the industry profits. Last, each retailer can discourage its rivals from deviating to exclusivity by adjusting the terms of its own exclusive dealing offer. Thus, when combined with conditional fixed fees, upfront payments do not lead to inefficient exclusion but may actually avoid it. Yet, upfront payments are still potentially detrimental for welfare, since they eliminate any effective retail competition.

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

Incidentally, our analysis supports the view that slotting allowances are associated with retail bargaining power.[10] If bargaining power were upstream, the industry monopoly outcome could be achieved without slotting allowances; standard two-part tariffs would suffice. Once retailers have the bargaining power, however, upfront payments are necessary to maintain monopoly prices.

Our paper is 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 the case of a monopolistic retailer and analyze whether a manufacturer can exclude a rival from distribution, when the initiative to offer contracts lies upstream. Because of the compensation required by the retailer, and in the absence of any specific contracting externalities, exclusion does not occur and standard (non-contingent) two-part tariffs suffice to achieve the industry monopoly outcome. Contracting externalities could arise for example from a restriction on contracts,[11] or from third parties not present at the contracting stage.[12] In contrast, in our setting where competing retailers offer contracts to a common supplier, simple two-part tariffs (even if contingent on exclusivity or not) do not suffice to implement the monopoly outcome; more complex arrangements, such as contingent three-part tariffs are required to internalize all the contracting externalities.

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 both retailers may be active in equilibrium but there always remains some retail competition; the outcome is therefore always inefficient from the firms' point of view. As we will see later on, 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, which limits retailers' ability to protect themselves against rivals' opportunistic moves; and (ii) contracts cannot be contingent

[10] 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).

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

[12] 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).

on market structure. In the case of relationships between manufacturers and retailers, it may however be more realistic to postulate 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.[13] 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 $P_i(q_i, q_{-i})$ 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,[14] we denote by Π^m the maximum profit that can be achieved by a fully

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

[14] Throughout the paper, the notation "$-i$" refers to retailer i's rival.

integrated firm:

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

When only product i is available, a vertically integrated firm (including M and R_i) 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 on its own is 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 (see the discussion in Section 7.1).

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, where contracts will also be bilaterally efficient, rich enough contracts, combining upfront payments and conditional fixed fees can achieve joint-profit maximization.

[15] De Fontenay and Gans (2005b) 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 the equilibrium payoffs in common agency situations, that is, in situations where both retailers are active. We will only assume here that, if 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 industry profits in equilibrium.

In any common agency equilibrium, the joint profits of a given 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 R_i and M jointly get at least their bilateral monopoly profit: for $i = 1, 2$,

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

This, in turn, implies that a retailer cannot earn more than its contribution to total profits: since by definition, $\pi_i^C + \pi_M^C = \Pi^C - \pi_{-i}^C$, condition (1) (written for "$-i$") implies that, 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 participation constraint is thus strictly satisfied in any common agency equilibrium.

[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.

Since individual rationality also requires $\pi_i^C \geq 0$ for all i, condition (2) implies 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 (paid either *by* or *to* the manufacturer), two-part tariffs with conditional fixed fees (paid only in case of actual trade) 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 maximize industry 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]

This result remains valid when rival retailers deal with a common supplier, provided that it is the supplier that chooses the terms of the contracts. 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, this result no longer holds when the retailers are the ones that choose the terms of the contracts. 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.

[18] This also 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).

Furthermore, in the context studied by Bernheim and Whinston, or when a single manufacturer offers (public) contracts to competing retailers, two-part tariffs need not be contingent on the set of accepted offers to sustain the common agency equilibrium. In contrast, Marx and Shaffer (2004) point out that when retailers have the initiative and offer non-contingent contracts, in any non-exclusive 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.[19] The retailer thus has an incentive to deviate to an exclusive dealing situation.[20]

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

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 non-exclusive option), R_{-i} cannot do better than also insist on exclusivity. In addition, if M sells at cost exclusively to R_i ($w_i = c, w_{-i} = +\infty$, say), R_i will maximize its joint profits with M, 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.*

[19] Note that retail margins are indeed positive whenever retail competition is imperfect (because of differentiation, as we assume here, Cournot competition in quantities, ...).

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

- *If $\Pi_1^m = \Pi_2^m$, there exist two exclusive dealing equilibria, where either retailer is active. In both cases, retailers earn zero profits and M gets Π_2^m.*

Proof. If one retailer offers only an exclusive dealing contract, then the other retailer cannot gain by making a non-exclusive offer. 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 marginal cost c, and equilibrium industry profits are Π_i^m.

For $\Pi_1^m > \Pi_2^m$, R_2 cannot be the 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, $\Pi_1^m - \Pi_2^m$.[21]

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; we will denote the continuation flow profits for R_i, M and the entire industry, respectively, by $\pi_i(w_1, w_2)$, $\pi_M(w_1, w_2)$ and $\Pi(w_1, w_2)$.

[21] 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 when both retailers are active: if $w_i = c$ for all i, retail competition leads to prices below their monopoly levels. Wholesale prices above cost could however be used to offset the impact of retail competition. In what follows, we will assume that high enough wholesale prices would sustain the monopoly outcome:[22]

Assumption A1. 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 choose $(\overline{w}_1, \overline{w}_2)$ and set fixed fees so as to recover retail margins: in this way, M would generate and appropriate the monopoly profits Π^m.[23] 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 non-exclusive tariff such that $w_{-i}^C = \overline{w}_{-i}$; offering $w_i^C = \overline{w}_i$ would then maximize industry profits, but not the bilateral joint profits of R_i and M, given by:

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

Hence, whenever the wholesale price w_i affects the rival retailer's profit $\pi_{-i}(w_1, w_2)$, the equilibrium cannot yield the industry monopoly outcome. To fix ideas, we will suppose in what follows that a retailer always benefits from an increase in its rival's wholesale price, that is:

Assumption A2. For $i = 1, 2$, $\dfrac{\partial \pi_{-i}(w_1, w_2)}{\partial w_i} > 0$.

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

[22] This is for example the case if the equilibrium outcome (quantities or prices for instance) varies continuously as wholesale prices increase. It then suffices to note that setting wholesale prices at the retail monopoly level would necessarily generates retail prices at least equal to that level.

[23] 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.

More generally, this reasoning implies that, in any equilibrium where both retailers are active, the wholesale price w_i^C must maximize the bilateral profits that R_i can achieve with M, given the wholesale price w_{-i}^C. That is, the equilibrium wholesale prices $\left(w_1^C, w_2^C\right)$ must satisfy:

$$w_i^C = W_i^{BR}(w_{-i}^C)\ ,\ \text{for } i = 1, 2, \tag{4}$$

where the best reply function $W_i^{BR}\left(w_{-i}\right)$ is given by:

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

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 the best reply optimization problems are well-behaved and that the system (4) has at least one solution:[24]

Assumption A3. (i) For $i = 1, 2$, $\Pi\left(w_1, w_2\right) - \pi_{-i}\left(w_1, w_2\right)$ is quasi-concave in w_i and achieves its maximum for $w_i = W_i^{BR}(w_{-i})$; and (ii) the system (4) has at least one solution.

In what follows, we denote by $(\widetilde{w}_1, \widetilde{w}_2)$ a solution of the system (4) for which the industry profits are the largest, and by $\widetilde{\Pi} \equiv \Pi(\widetilde{w}_1, \widetilde{w}_2)$ these profits. Note that A2 implies $W_i^{BR}(\overline{w}_{-i}) < \overline{w}_i$, and thus $(\widetilde{w}_1, \widetilde{w}_2) \neq (\overline{w}_1, \overline{w}_2)$ and $\widetilde{\Pi} < \Pi^m$.[25]

Two-part tariffs thus cannot implement the industry monopoly outcome: when both retailers are active, contracting externalities prevent the retailers from using the manufacturer as a perfect coordination device. This lack of coordination may in turn keep one retailer from being active in equilibrium. Indeed, from the preliminary analysis in section 3, both retailers can be active only if this generates higher 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 it cannot be that both retailers are active in equilibrium, even though a fully integrated structure would want both of them to be active.

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

[25]Even if A2 does not hold, $\widetilde{\Pi} < \Pi^m$ whenever $\partial\pi_{-i}\left(\overline{w}_1, \overline{w}_2\right)/\partial w_i \neq 0$ for at least one retailer i.

Conversely, with contingent tariffs, condition (5) guarantees the existence of an equilibrium in which both retailers are active and each of them moreover earns its entire contribution to equilibrium profits. 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 benefit from deviating to another common agency outcome. Finally, it is straightforward to check that no retailer can deviate profitably to an exclusive dealing arrangement, since the equilibrium already gives each $R_i - M$ pair

$$\pi_i^C + \pi_M^C = \Pi_i^m.$$

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

Proposition 2 *When contract offers are restricted to two-part tariffs, common agency equilibria (i.e., equilibria where both retailers are active) exist if and only if* $\widetilde{\Pi} \geq \Pi_1^m$*, in which case:*

- *industry profits are* $\widetilde{\Pi} < \Pi^M$*;*
- *if* $\widetilde{\Pi} > \Pi_1^m$*, then both retailers prefer the common agency equilibrium in which each* R_i *earns its entire contribution to industry profits,* $\widetilde{\Pi} - \Pi_{-i}^m$*, while the manufacturer earns* $\Pi_1^m + \Pi_2^m - \widetilde{\Pi}$*, to all other equilibria;*

- *if $\widetilde{\Pi} = \Pi_1^m$, then the unique common agency equilibrium is payoff equivalent to the retailers' preferred exclusive dealing equilibrium.*

Thus, contrary to the insight of Marx and Shaffer (2004) in the context of non-contingent contracts, both retailers may well be active in equilibrium: contingent contracts help ensuring that M gets the same profit with either exclusive dealing offer as with the equilibrium "non-exclusive" offers, which in turn reduces the scope for deviations to exclusivity.

Comparison with Bernheim and Whinston (1985, 1998)

At this point, it is useful to compare our analysis with Bernheim and Whinston's seminal papers on common agency and exclusive dealing. They consider situations where manufacturers of imperfect substitutes offer (contingent) supply contracts to a common retailer. Focusing on equilibria that are Pareto-undominated from the point of view of the manufacturers, on the grounds that they are first-movers, Bernheim and Whinston find that (in the absence of any specific agency problems, which we also assume away here) two-part tariffs suffice to achieve the industry monopoly profits. Since each manufacturer can recover any residual retail profit through the fixed fee, it maximizes its joint profit with the retailer, and does so by pricing at marginal cost; but then, the joint profits of a vertical pair coincide, up to a constant (the rival's fixed fee), with the industry profits – in particular, there is no rival's margin to free-ride upon. In other words, manufacturers can use the common agent to align their interests and achieve the monopoly outcome. As a result, the manufacturers' preferred equilibrium always involves common agency.

In contrast, in the context we analyze, retailers have an incentive to free-ride on each other's margins, which are positive as long as retailers are imperfect substitutes. As a result, retailers fail to achieve the industry monopoly outcome; non-exclusive situations therefore generate lower profits and, as a result, may not even be sustainable in equilibrium.

5 Conditional Fixed Fees

As we have seen, standard two-part tariffs 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 internalizing some of the contracting externalities and allow the parties to sustain higher prices and profits. The basic intuition is that high conditional fixed fees can protect retailers against aggressive behavior on the downstream market.

We thus consider now contingent contracts in which the fixed fees are conditional on actual trade taking place; 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 the retailers' participation constraints are trivially satisfied here, since retailers can always avoid a loss by choosing not to buy (and therefore waive the fixed fee) in the last stage.

Exclusive Dealing Equilibria

With standard two-part tariffs, the unique trembling-hand perfect exclusive dealing equilibrium, which coincides with the Pareto-undominated (for the retailers) exclusive dealing 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 dealing 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 dealing 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 pseudo common agency equilibrium is outcome equivalent to the unique exclusive dealing equilibrium just described. In what follows, we therefore focus on "proper" common agency equilibria in which both retailers eventually buy positive quantities.

"Proper" Common Agency Equilibria

In any proper common agency equilibrium, where both retailers buy positive quantities, we must have:

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

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 change 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: $w_{-i}^C = W_{-i}^{BR}(w_i^C)$.[26]

Therefore, if the inequality (6) is strict for all $i = 1, 2$, then both retailers must be on their best reply functions; industry profits are then bounded above by $\widetilde{\Pi}$, and R_i cannot hope to earn more than $\widetilde{\Pi} - \Pi_{-i}^m$. Conversely, it is straightforward to check that, whenever $\widetilde{\Pi} \geq \Pi_1^m$, the equilibrium described in the previous section, where each R_i gets $\widetilde{\Pi} - \Pi_{-i}^m$ and M gets $\Pi_1^m + \Pi_2^m - \widetilde{\Pi}$, remains an equilibrium when fixed fees are conditional: the only difference is that some deviations that previously led to an alternative proper common agency situation may now lead instead to a *pseudo* common agency situation.[27] However, any such deviation is formally equivalent to a deviation to exclusivity, since in both cases the variable profits are the same and the inactive retailer pays no fixed fee. Thus, in essence, there are now fewer deviation possibilities: some deviations to proper common agency situations may no longer be available, while deviations to exclusive dealing situations remain the same (and some of them may now be also achieved by deviating to pseudo common agency). As a result, all the common agency equilibria obtained with unconditional fixed fees (which, because of the participation constraints, necessarily satisfied (6) for $i = 1, 2$) remain (proper) common agency equilibria with conditional fixed fees.

We now look for equilibria where (6) is binding for at least one retailer. For the sake of exposition, we will focus on the case where R_1 is strictly more profitable: $\Pi_1^m > \Pi_2^m$. We will briefly discuss the case of equally profitable retailers ($\Pi_1^m = \Pi_2^m$) at the end of the section.

We first note that (6) cannot be binding for R_1, since this would imply that R_1 gets

[26] We assume in this section that a 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 pseudo common agency 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.

[27] This can happen if a deviation by its rival reduces a retailer's flow profits below its conditional fixed fee.

no profit $\left(\pi_1^C = 0\right)$: as noted above, M cannot earn more than Π_2^m by accepting R_2's exclusive dealing offer; therefore, in equilibrium, R_1 must get at least

$$\pi_1^C \geq \Pi_1^m - \Pi_2^m > 0,$$

otherwise it could profitably deviate to exclusivity. Hence, given the above discussion, we must have:

- $F_1^C < \pi_1\left(w_1^C, w_2^C\right)$, and thus $w_2^C = W_2^{BR}(w_1^C)$;
- $F_2^C = \pi_2\left(w_1^C, w_2^C\right)$, and thus $\pi_2^C = 0$.

Since R_2 can offer M up to, but no more than, Π_2^m for exclusivity, M must earn exactly $\pi_M^C = \Pi_2^m$. R_1 then earns $\pi_1^C = \Pi\left(w_1^C, w_2^C\right) - \Pi_2^m$. Deviations to exclusivity must moreover be unprofitable, which amounts here to $\Pi\left(w_1^C, w_2^C\right) \geq \Pi_1^m$. Consider now deviations to alternative non-exclusive outcomes. Given A2, any deviation to $w_1 < w_1^C$ would decrease R_2's anticipated retail profit and thus lead to a "pseudo common agency" situation where only R_1 trades, and which is payoff equivalent to exclusive dealing. Such deviations are thus unprofitable. In contrast, deviations to $w_1 > w_1^C$ would increase R_2's anticipated retail profit and thus lead to a proper common agency outcome, in which R_1 and M would jointly get

$$\pi_1\left(w_1, w_2^C\right) + \pi_M\left(w_1, w_2^C\right) + F_2^C = \Pi\left(w_1, w_2^C\right) - \pi_2\left(w_1, w_2^C\right) + F_2^C,$$

which is maximal for $w_i = W_i^{BR}(w_{-i}^C)$. Thus, if $W_1^{BR}\left(w_2^C\right) > w_1^C$, R_1 could profitably deviate by offering a non-exclusive option with $w_1 = W_1^{BR}\left(w_2^C\right)$, together with a fixed fee that shares the additional profit with M; conversely, from the quasi-concavity assumption in A3, if $W_1^{BR}\left(w_2^C\right) \leq w_1^C$ it is not possible to find a profitable deviation involving a wholesale price $w_1 > w_1^C$.

To sum up, in any equilibrium in which (6) binds for R_2 (only), $\left(w_1^C, w_2^C\right)$ must satisfy $w_2^C = W_2^{BR}\left(w_1^C\right)$ and $w_1^C \geq W_1^{BR}\left(w_2^C\right) = W_1^{BR}\left(W_2^{BR}\left(w_1^C\right)\right)$.[28] Clearly, the highest profit that can be generated in this way is:

$$\widehat{\Pi}_1 = \max_{w_1 \geq W_1^{BR}\left(W_2^{BR}(w_1)\right)} \Pi\left(w_1, W_2^{BR}\left(w_1\right)\right).$$

[28] If wholesale prices are strategic complements (i.e. $\left(W_i^{BR}\right)' > 0$) or strategic substitutes (i.e. $\left(W_i^{BR}\right)' < 0$) and the equilibrium characterized in the previous section is stable (i.e., $\partial W_2^{BR}/\partial w_1 . \partial W_1^{BR}/\partial w_2 < 1$), then the constraint $w_1 \geq W_1^{BR}\left(W_2^{BR}\left(w_1\right)\right)$ boils down to $w_1 \geq \widetilde{w}_1$.

We will denote by $\widehat{w}_1$ and $\widehat{w}_2$ the wholesale prices that generate $\widehat{\Pi}_1$. Note that $\widehat{\Pi}_1 \in \left[\widetilde{\Pi}, \Pi^m\right[$: since $\widehat{w}_2 = W_2^{BR}(\widehat{w}_1)$ while $\overline{w}_2 \neq W_2^{BR}(\overline{w}_1)$, $\widehat{\Pi}_1 < \Pi^m$; and since by construction $\widetilde{w}_1$ satisfies (with an equality) the constraint $w_1 \geq W_1^{BR}\left(W_2^{BR}(w_1)\right)$, we have $\widehat{\Pi}_1 \geq \widetilde{\Pi}$ (with a strict inequality whenever $\widehat{w}_1 \neq \widetilde{w}_1$).

The following proposition shows that $\widehat{\Pi}_1$ can indeed be achieved in equilibrium:

Proposition 3 *When $\Pi_1^m > \Pi_2^m$ and 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:*

(i) If $\widehat{\Pi}_1 \geq \Pi_1^m > \widetilde{\Pi}$, in any (exclusive dealing or common agency) 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) is non-exclusive and yields a profit $\widehat{\Pi}_1 - \Pi_2^m$ for R_1.

(ii) If $\widetilde{\Pi} \geq \Pi_1^m$, there are two Pareto-undominated equilibria for the retailers, which are both non-exclusive: the equilibrium described in i), which yields $\widehat{\Pi}_1 - \Pi_2^m$ to R_1 and 0 to R_2, and the equilibrium described in section 4, 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 $\widetilde{\Pi} \geq \Pi_1^m$. In addition, there may exist equilibria in which (6) binds for R_2 (only), provided that $\left(w_1^C, w_2^C\right)$ satisfies $\Pi\left(w_1^C, w_2^C\right) \geq \Pi_1^m$, $w_2^C = W_2^{BR}\left(w_1^C\right)$ and $w_1^C \geq W_1^{BR}\left(w_2^C\right) = W_1^{BR}\left(W_2^{BR}\left(w_1^C\right)\right)$. By construction, these equilibria cannot generate a higher profit than $\widehat{\Pi}_1$; therefore, no such equilibrium exists if $\widehat{\Pi}_1 < \Pi_1^m$.

Conversely, suppose that $\widehat{\Pi}_1 \geq \Pi_1^m$ and consider the following candidate equilibrium:

- $w_i^C = \widehat{w}_i$, so that industry profits are equal to $\widehat{\Pi}_1$;
- F_1^C is such that R_1 gets exactly $\pi_1^C = \widehat{\Pi}_1 - \Pi_2^m > 0$ and $F_2^C = \pi_2\left(w_1^C, w_2^C\right)$, so that R_2 gets $\pi_2^C = 0$ while 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 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 $\Pi_2^m = \pi_M^C + \pi_2^C$ for 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.[29]

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: given $w_2^C = \widehat{w}_2$ and the quasi-concavity assumption in A3, R_1 would like to move towards $w_1 = W_1^{BR}(\widehat{w}_2) \leq \widehat{w}_1$; thus, either $\widehat{w}_1 = W_1^{BR}(\widehat{w}_2)$, in which case R_1 cannot gain from moving away to $w_1^C = \widehat{w}_1$, or $\widehat{w}_1 < W_1^{BR}(\widehat{w}_2)$, in which case R_1 would wish to reduce w_1^C below $\widehat{w}_1$, but cannot do so because this would lead R_2 to "opt out". Hence the above contracts constitute an equilibrium.

If $\widehat{\Pi}_1 \geq \Pi_1^m > \widetilde{\Pi}$, 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 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. If $\widetilde{\Pi} \geq \Pi_1^m$, in addition to the equilibria just mentioned there also exist 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, non-exclusive 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 $\widehat{\Pi}_1$ is at least as large as $\widetilde{\Pi}$. In the additional common agency equilibria, however, the less profitable retailer gets zero profit; hence when $\widetilde{\Pi} \geq \Pi_1^m$, the retailers disagree with respect to the equilibrium selection: the more profitable retailer prefers for the new equilibrium, while the other retailer favors 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 "asymmetric" equilibria. In each of these, the "winning" retailer R_i gets up to $\widehat{\Pi}_i - \Pi_{-i}^m$, where $\widehat{\Pi}_1$ is defined as above and

$$\widehat{\Pi}_2 \equiv \max_{w_2 \geq W_2^{BR}\left(W_1^{BR}(w_2)\right)} \Pi(W_1^{BR}(w_2), w_2),$$

while the other retailer earns zero profit.

[29] 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.

6 Three-Part Tariffs

Let us 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 entire contribution to these profits, $\Pi^m - \Pi_{-i}^m$. To see this, consider the following contracts: for $i = 1, 2$,

- $U_i^C = -\left[\Pi^m - \Pi_{-i}^m\right] < 0$, so that retailers get their contributions to the industry profits through 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 $F_i^E + U_i^E = \Pi_1^m + \Pi_2^m - \Pi^m$,[30] so that M could also secure its equilibrium profit by dealing exclusively with either retailer.

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

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

- Since M can get its profit π_M^C by opting as well for either retailer's exclusive offer, R_i must increase its joint profits with M in order to benefit from a deviation.

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

- These joint profits are already equal to Π_i^m in the candidate equilibrium (since R_{-i} gets exactly $\Pi^m - \Pi_i^m$); therefore, R_i cannot lure M into a more profitable exclusive dealing arrangement.

- Bilateral profits cannot be higher than Π_i^m in any (pseudo or proper) common agency situation either, since total industry profits cannot exceed Π^m and R_{-i} can always secure at least $-U_i^C = \Pi^m - \Pi_i^m$ by not selling in the last stage.

The above contracts thus constitute an equilibrium where both retailers are active and each retailer R_i earns its 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, there exists an equilibrium in which both retailers are active, industry profits are at the monopoly level, and each retailer earns its entire contribution to these profits.*

Out of all equilibria (with either one or both retailers being active), both retailers prefer this equilibrium; this equilibrium 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 to protect retailers against rivals' opportunistic moves:[31] if a retailer were to undercut its rival, the rival would "opt out" and waive the conditional payment to the manufacturer, which would reduce the profitability of the deviation. To sustain the monopoly outcome, however, the conditional fixed fees must be large (equal to the all of the retailers' variable profits); therefore, to get their share of the profit, retailers must receive down payments from the manufacturer (i.e., $U_i < 0$).[32] Proposition 4 thus shows how slotting allowances or other forms of down payments can contribute to eliminate competition.

[31] 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.

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

Conversely, retailers could not gain from offering positive upfront fees: the following proposition shows that, when *negative* upfront fees are forbidden, the situation is the same as when upfront payments are entirely ruled out and retailers therefore simply propose conditional two-part tariffs.

Proposition 5 *If negative upfront fees (i.e. upfront payments made by the manufacturer to the retailers) are forbidden, three-part tariffs yield the same (trembing-hand perfect) equilibrium outcomes as conditional two-part tariffs.*

Proof. It is straightforward to check that restricting upfront fees to be non-negative has no effect on the exclusive dealing equilibria obtained with either classic two-part tariffs, conditional two-part tariffs or three-part tariffs; and in each case, the equilibrium yielding zero profit to R_2 and $\Pi_1^m - \Pi_2^m$ to R_1 is either the unique equilibrium or the unique trembling-hand perfect one.

We now turn to common agency equilibria. Since any "pseudo" common agency equilibrium is equivalent to an exclusive dealing equilibrium, we will focus on "proper" common agency equilibria and show that they yield the same outcomes in the conditional two-part tariff game studied in the previous section as in the "constrained" three-part tariff game where upfront payments are restricted to be non-negative.

a) Any proper common agency equilibrium outcome of the constrained three-part tariff game is also an equilibrium outcome in the conditional two-part tariff game.

Let $\left(\mathcal{T}_i^E, \mathcal{T}_i^C\right)_{i=1,2}$, where $\mathcal{T}_i^j \equiv \left(U_i^j \geq 0, F_i^j, w_i^j\right)$ for $j = C, E$, denote an equilibrium of the "constrained" three-part tariff game and consider the modified offers $\left(\mathcal{C}_i^E, \mathcal{C}_i^C\right)_{i=1,2}$ where all fees become conditional ones: $\mathcal{C}_i^j \equiv \left(0, U_i^j + F_i^j, w_i^j\right)$ for $j = C, E$. Since the retailers' participation constraints impose $U_i^C + F_i^C \leq \pi_i\left(w_1^C, w_2^C\right)$ for $i = 1, 2$, these offers, if accepted, lead to the same proper common agency outcome as $\left(\mathcal{T}_i^E, \mathcal{T}_i^C\right)_{i=1,2}$. Similarly, any deviation to exclusivity or to an alternative proper common agency situation lead to the same outcome as when deviating from $\left(\mathcal{T}_i^E, \mathcal{T}_i^C\right)_{i=1,2}$: whether fees are upfront or conditional is irrelevant in both cases. The only difference is that some deviations previously leading to proper common agency might now lead to pseudo common agency outcomes (if they reduce the rival's variable profit below its total fee); however, deviations to "pseudo" common agency can never yield higher profits than deviations to exclusive dealing.

Therefore, if $\left(\mathcal{T}_i^E, \mathcal{T}_i^C\right)_{i=1,2}$ is an equilibrium of the constrained three-part tariff game, $\left(\mathcal{C}_i^E, \mathcal{C}_i^C\right)_{i=1,2}$ is also an equilibrium of that game, which moreover satisfies the restriction

$U_i^j \geq 0$ for $i = 1, 2$ and $j = C, E$. But since deviations in conditional two-part tariffs are more limited than deviations in constrained three-part tariffs, $\left(\mathcal{C}_i^E, \mathcal{C}_i^C\right)_{i=1,2}$ is then an equilibrium of the conditional two-part tariff game, which moreover yields the same outcome as the original contract equilibrium $\left(\mathcal{T}_i^E, \mathcal{T}_i^C\right)_{i=1,2}$.

b) Any proper common agency equilibrium of the conditional two-part tariff game is an equilibrium of the constrained three-part tariff game.

We will actually show that any equilibrium of the conditional two-part tariff game is an equilibrium of the *unconstrained* three-part tariff game. The conclusion then follows, since by construction these equilibrium offers satisfy the restriction $U_i^j \geq 0$ (since $U_i^j = 0$) and deviations are more limited in the constrained three-part tariffs game.

If a (proper) common agency equilibrium of the conditional two-part tariffs game is not an equilibrium of the constrained three-part tariff game, at least one retailer R_i must have a profitable deviation $\left(\mathcal{D}_i^E, \mathcal{D}_i^C\right)$, where $\mathcal{D}_i^j \equiv \left(V_i^j, G_i^j, v_i^j\right)$ for $j = C, E$, that was not feasible in the conditional two-part tariff game. This profitable deviation must moreover be a deviation to an alternative proper common agency outcome, since: (i) whether fixed fees are upfront or conditional is irrelevant for deviations to exclusive dealing; and (ii) deviations to pseudo common agency are equivalent to deviations to exclusive dealing. But to be accepted, the deviation must satisfy $\pi_i\left(v_i^C, w_{-i}^C\right) \geq G_i^C + V_i^C$, which implies that offering $\left(\mathcal{F}_i^E, \mathcal{F}_i^C\right)$, with $\mathcal{F}_i^j = \left(0, G_i^j + V_i^j, v_i^j\right)$ for $j = C, E$, would be a profitable deviation in the game with conditional two-part tariffs, a contradiction.

Therefore, the equilibrium outcomes are the same in the games with conditional two-part tariffs and with constrained three-part tariffs.[33] ■

The intuition for this result is relatively straightforward: with three-part tariffs, conditional fees are used by a retailer as an "exit threat" in order to prevent its rival from free-riding on its sales; negative upfront payments are then used to transfer some of the industry profit to the retailers. If negative upfront payments are forbidden, this is no longer feasible since retailers will no longer be willing to offer high conditional fees. And a retailer has no incentives to use positive upfront fees, since splitting the total fee into an upfront and a conditional part weakens its exit threat without increasing its profit.[34]

[33] Equilibrium offers might however differ since, for some common agency equilibria with constrained three-part tariffs, only the sum of the two fixed fees matters.

[34] Fixed fees might sometimes be negative in equilibria with conditional two-part tariffs, in which case banning all negative fees (including negative conditional fees) would yield a different outcome: common agency equilibria would then be more competitive but would exist less often. Proposition 5 remains however valid when comparing the set of equilibria with similarly restricted three-part and (conditional)

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

- A non-linear tariff of the form $T_i(q_i) = \left(P_i\left(q_i, q_{-i}^m\right) - c\right) q_i + U_i$, 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.

- "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 the monopoly price $\left(w_i = p_i = P_i\left(q_i^m, q_{-i}^m\right)\right)$. This would prevent each $R_i - M$ pair 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.[35]

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). They consider "bidding games" where, as here, downstream firms offer non-linear contracts to a common supplier, but consider the case where it is the supplier that eventually chooses the quantities to procure; while we find that three-part tariffs can achieve the integrated monopoly outcome, in their settings externalities always generate an inefficient outcome for the firms.[36] The reason is that when the quantity q_i is chosen by M rather than by R_i,

two-part tariffs.

[35] 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 a purely vertical contract.

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

the negotiation over $T_i(.)$ has then no effect on q_{-i};[37] 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 integrated structure.[38] More generally, when the manufacturer directly chooses quantities, retailers play no strategic role once they have determined the terms of their contracts. As a result, whether contracts are public or secret does not matter. Moreover, whether the terms are set by the upstream or downstream parties has no impact on final prices: either way, each vertical structure will maximize its joint profit, which will result in the same equilibrium prices.[39]

In our framework, downstream prices and quantities are determined by retailers; as a

[37] While retailers' marginal revenue depend on each other's quantities, the supplier's profit is separable in in q_1 and q_2. (Dis-)economies of scale or scope would however remove this separability. Relatedly, absent antitrust concerns, tariffs contingent on the rival's price or quantity would also introduce a link between the two quantity choices. Battigalli *et al.* (2006) show for example that tariffs with slotting allowances and contingent on the rival's quantity yield the monopoly outcome even when quantities are decided ex post by the manufacturer rather than by the retailers. They then study the implications of buyer power on the manufacturer's incentive to maintain quality.

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

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

Therefore, if the cost function is separable in q_1 and q_2 (i.e. $C(q_1,q_2) = C_1(q_1) + C_2(q_2)$), each quantity q_i^R is indeed independent of T_{-i}, that is, $q_i^R(T_1,T_2) = q_i^R(T_i)$. 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:

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

The equilibrium quantities are thus given by:

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

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}.

[39] More precisely, prices will be the same for "contract equilibria" (see O'Brien and Shaffer (1992)), where only single-sided deviations are considered. When the manufacturer chooses the terms of the contracts, however, it may modify both contracts at the same time, which makes the analysis more complex – relatedly, when one retailer receives an unexpected offer, it may revise its beliefs concerning the contracts being offered to its rivals; see Rey and Vergé (2004) for a discussion of these issues.

result, R_{-i}'s behavior responds to R_i's contract. If this response were smooth, however, the outcome would remain 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 R_i and M's joint profits, $\pi_{R_i - M}$:

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

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:

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

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:

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

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

In order to generate the efficient outcome (from the firms' point of view), a small change in R_i's contract must therefore induce a *"large"* (i.e. discontinuous) change in R_{-i}'s behavior. This is 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 R_i and M try to free-ride on R_{-i}'s sales, R_{-i} opts out (i.e., q_{-i}^{BR} drops to zero) and waives the fee F_{-i}^C, which makes the deviation unprofitable.

Our results also differ strikingly from those obtained by Marx and Shaffer (2004) who look at the same situation as we do but restrict attention to 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 (exclusivity or not), 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.[40]

7.2 Policy Implications

We now use our analysis to assess the impact of slotting allowances (down payments by the manufacturer to the retailers, i.e., negative upfront fees in our setup) on prices and welfare. Slotting allowances allow the firms to eliminate competition and sustain the monopoly profits, and retailers can clearly benefit from this, since (i) they can never get more than their contribution to industry profits, and (ii) with slotting allowances, they can get their entire contributions 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 are Pareto-undominated for the

[40] 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.

retailers.[41]

When slotting allowances by the manufacturer are allowed, then retailers get their entire contribution to the monopoly profits, leaving $\Pi_1^m + \Pi_2^m - \Pi^m$ to the manufacturer. When instead slotting allowances 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 (Proposition 4).
- If instead slotting allowances are not allowed, Proposition 5 shows that the equilibria are the same as those described in Propositions 2 and 3; therefore:[42]
  - if $\Pi_1^m > \widehat{\Pi}_1$, 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.
  - if $\widehat{\Pi}_1 \geq \Pi_1^m > \widetilde{\Pi}$, the unique Pareto-undominated equilibrium for the retailers, which we will denote by $\widehat{\mathcal{E}}$, is such that both retailers are active; in this equilibrium R_2 is on its best response, i.e., $\widehat{w}_2 = W_2^{BR}(\widehat{w}_1)$, whereas $\widehat{w}_1$ maximizes

[41] The comparison might otherwise be less meaningful. In particular, the class of contracts that are considered would 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.

[42] 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.

the industry profits along part of that best response:

$$\widehat{w}_1 = \underset{w_1 \geq W_1^{BR}\left(W_2^{BR}(w_1)\right)}{\arg\max} \Pi\left(w_1, W_2^{BR}(w_1)\right).$$

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

Banning slotting allowances may thus replace the integrated monopoly outcome either with:

- exclusive dealing (if $\Pi_1^m > \widehat{\Pi}_1$), in which case consumers and society are likely to be hurt, since they face monopoly prices anyway but the second retailer is then morover excluded; or
- 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 be lower than the monopoly level; this is for example the case 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.[43]

The welfare implications of banning slotting allowances are thus a priori ambiguous. On the one hand, if both retailers 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 a ban on slotting allowances, it is therefore necessary to identify factors that influence whether exclusion is likely or not, which hinges on the comparison between $\widehat{\Pi}_1$ or $\widetilde{\Pi}$, on the one hand, and Π_1^m, on the other hand. One would expect $\widetilde{\Pi}$ and $\widehat{\Pi}_1$ to be higher than Π_1^m when the retailers are highly differentiated.

[43] 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; when the best-responses $W_i^{BR}(.)$ satisfy the strategic complementarity and stability assumptions, it is straightforward to check that 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.

Indeed, if the retailers are selling on independent markets, then $\Pi^m = \Pi_1^m + \Pi_2^m$ and, in addition, the pair $R_i - M$ no longer has an incentive to free-ride on R_{-i}'s sales (in particular, Assumption A2 does not hold), so that the equilibrium profit is equal to the monopoly profit: $\widetilde{\Pi} = \Pi^m$; therefore, $\widehat{\Pi} \geq \widetilde{\Pi} > \Pi_1^m$, implying that both retailers can be active even if slotting allowances are banned. If instead retailers are perfect substitutes, $\Pi^m = \Pi_1^m$ and $\widehat{\Pi}_1 < \Pi^m$; therefore, $\widetilde{\Pi} \leq \widehat{\Pi}_1 < \Pi_1^m$, implying that $\widehat{\mathcal{E}}$ or $\widetilde{\mathcal{E}}$ cannot be the outcome when slotting allowances are ruled out. Banning slotting allowances is therefore more likely to induce exclusion when products are less differentiated.

A similar analysis can be made concerning the relative strengths of the retailers: the inequality $\left(\widetilde{\Pi} \leq\right) \widehat{\Pi}_1 < \Pi_1^m$ 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, symmetry may render exclusion less likely.

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

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

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 R_1 becomes relatively larger than R_2 as α increases) while σ represents the degree of substitutability between the retailers (retailers face independent demands when $\sigma = 0$, while they become closer substitutes 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 assigns 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, for the cases of quantity (bold lines) and price (dashed lines) competition.

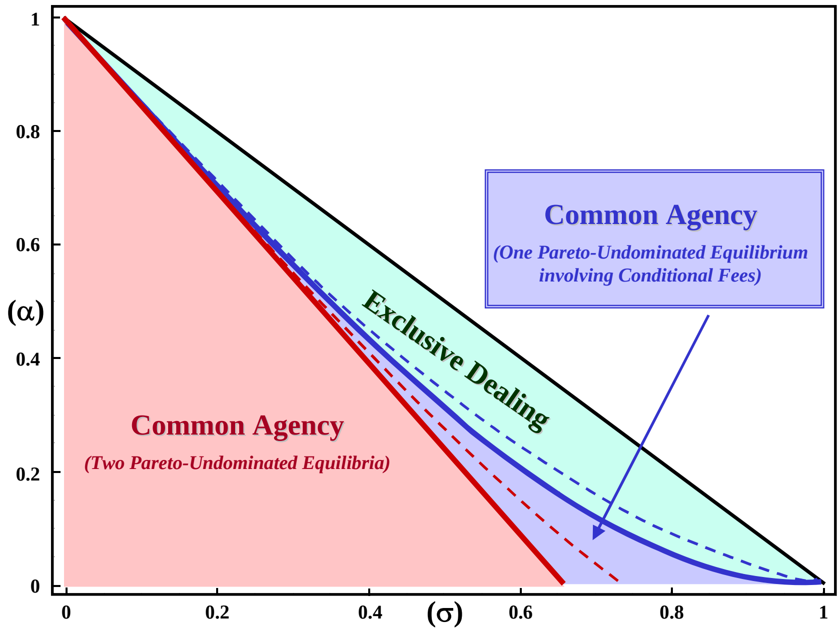
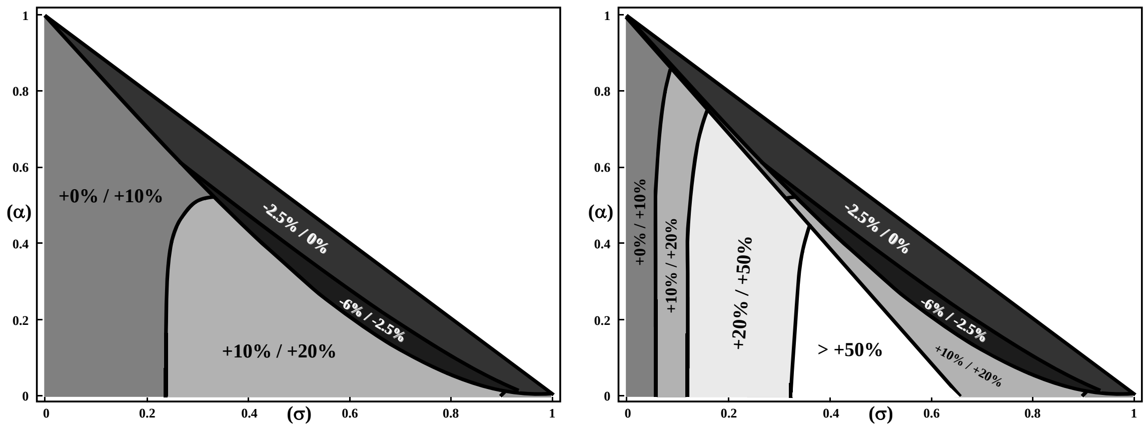


Figure 1: Pareto-undominated equilibrium outcomes when slotting allowances are banned

This figure confirms the previous insights: exclusion is more likely when retailers are close substitutes (σ high) and/or relatively asymmetric (α high), that is, when $\alpha + \sigma$ is close to its upper bound; as retailers become more differentiated or more symmetric (i.e., as either σ or α decrease), equilibria appear (first $\widehat{\mathcal{E}}$, and then $\widetilde{\mathcal{E}}$) where both retailers are active.

Figure 1 also shows that, absent slotting allowances, both retailers are more likely to be active when they compete in prices rather than in quantities. Compared with quantity competition, price competition is as usual more aggressive and thus results in lower retail margins. But this reduces here each $M - R_i$ pair's incentives to free-ride on the rival's sales, thereby increasing the profits achieved in the candidate common agency equilibrium, which in turn decreases the likelihood of exclusion: $\widehat{\Pi}_1$ and $\widetilde{\Pi}$ are higher, and thus more likely to exceed Π_1^m, in the case of price competition.

Figure 2 shows the impact of banning slotting allowances on consumer surplus for the case of quantity competition – results are similar for price competition. Figure 2(i) is drawn for the "worst" case scenario, i.e., selecting the worst equilibrium from the consumer point of view $\left(\widehat{\mathcal{E}}\right)$ when both $\widehat{\mathcal{E}}$ and $\widetilde{\mathcal{E}}$ exist (i.e., for low values of σ and α); Figure 2(ii) focuses instead on the best equilibrium for consumers $\left(\widetilde{\mathcal{E}}\right)$ when both $\widehat{\mathcal{E}}$ and $\widetilde{\mathcal{E}}$ exist.



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

Figure 2: Impact of banning slotting allowances on consumer surplus

Banning slotting allowances harms consumers (and society) when it leads to the exclusive dealing. However, as already oberved, this is more likely to occur when retailers are good substitutes and/or rather asymmetric (high values of σ and/or α), which is precisely when the exclusion of the weaker retailer is socially less costly. As a result, the positive effects of a ban on slotting allowances appear here likely to be larger than its negative effects.[44]

8 Conclusion

This paper examines the role of upfront payments and conditional fixed fees in determining market structure and retail prices. We first show that two-part tariffs 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 retailers to achieve higher profits, by serving as a commitment to "opt out" in case prices become too low; this in turn expands the scope for equilibria in which both retailers are active.

[44] In the case of quantity competition, the results are the same when all negative fees are banned, rather than only negative upfront ones. However, things change in that case when retailers compete in prices: while the $\widetilde{\mathcal{E}}$ equilibrium is unaffected, the $\widehat{\mathcal{E}}$ equilibrium becomes more competitive and thus exists less often when negative conditional fees are banned as well. This extends the range of parameter values for which banning negative payments has a negative impact but the qualitative analysis and the order of magnitude of the effects remain the same.

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 amount of retail differentiation or asymmetry. 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 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 sustain monopoly prices.

The welfare implications of banning slotting allowances are more ambiguous. Slotting allowances may avoid the exclusion of some 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, these alternative means still 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, in recent years the bargaining power has often shifted towards large retailers. 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 is in line with 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 in this equilibrium both retailers are always active. In contrast, in Marx and Shaffer (2004) where contracts are non-contingent, (negative) upfront payments only arise when retailers are asymmetric, and whenever they arise they always lead to exclusion of a retailer.

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.

References

[1] Allain, Marie-Laure and Claire Chambolle (2005), "Loss-Leaders Banning Laws as Vertical Restraints." *Journal of Agricultural & Food Industrial Organization,* 3, Article 5.

[2] Aghion, Philippe and Patrick Bolton (1987), "Contracts as a Barrier to Entry." *American Economic Review*, 77, 388-401.

[3] Battigalli, Pierpaolo, Chiara Fumagalli and Michele Polo (2006), "Buyer Power and Quality Improvement." *IGIER Working Paper* n°310.

[4] Bernheim, Douglas and Michael Whinston (1985), "Common Marketing Agency as a Device for Facilitating Collusion." *Rand Journal of Economics,* 16, 269-281.

[5] Bernheim, Douglas and Michael Whinston (1998), "Exclusive Dealing." *Journal of Political Economy,* 106, 64-103.

[6] Bloom, Paul, Gregory Gundlach and Joseph Cannon (2000), "Slotting Allowances and Fees: School of Thought and the Views of Practising Managers." *Journal of Marketing*, 64, 92-108.

[7] Comanor, William and Patrick Rey (2000), "Vertical Restraints and the Market Power of Large Distributors." *Review of Industrial Organization*, 17, 135-153.

[8] Competition Commission (2000), *Supermarkets: A report on the supply of groceries from multiple stores in the United Kingdom.* Cm 4842, October 2000.

[9] de Fontenay, Catherine and Joshua Gans (2005a), "Bilateral Bargaining with Externalities." Mimeo.

[10] de Fontenay, Catherine and Joshua Gans (2005b), "Vertical Integration in the Presence of Upstream Competition." *Rand Journal of Economics*, 35(3), 544-572.

[11] Federal Trade Commission (2001), *Report on the FTC Workshop on Slotting Allowances and Other Marketing Practices in the Grocery Industry.*

[12] Federal Trade Commission (2003), *Slotting Allowances in the Retail Grocery Industry: Selected Case Studies in Five Product Categories.*

[13] Hart, Oliver and Jean Tirole (1990), "Vertical Integration and Market Foreclosure." *Brookings Papers on Economic Activity: Microeconomics,* 205-286.

[14] Kelly, Kenneth (1991), "Antitrust Analysis of Grocery Slotting Allowances: The Procompetitive Case." *Journal of Public Policy and Marketing*, 10, 187-198.

[15] Klein, Benjamin, and Joshua Wright (2006), "The Economics of Slotting Contracts." Mimeo.

[16] Inderst Roman (2005), "A Note on Buyer-Induced Exclusivity and the Role of Slotting Fees." Mimeo.

[17] Inderst, Roman and Christian Wey (2006), "Buyer Power and Supplier Incentives." forthcoming in *European Economic Review.*.

[18] Mathewson, Frank and Ralph Winter (1987), "The Competitive Effects of Vertical Agreements: Comments." *American Economic Review*, 77, 1057-1062.

[19] Martimort, David and Lars Stole (2003), "Contractual Externalities and Common Agency Equilibria." *Advances in Theoretical Economics*, 3(1), Article 4.

[20] Marx, Leslie and Greg Shaffer (2004). "Upfront Payments and Exclusion in Downstream Markets." Mimeo.

[21] McAfee, Preston and Marius Schwartz (1994), "Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity and Uniformity." *American Economic Review,* 84, 210-230.

[22] O'Brien, Daniel and Greg Shaffer (1992), "Vertical Control with Bilateral Contracts." *Rand Journal of Economics,* 23, 299-308.

[23] Office of Fair Trading (2004), *The supermarkets code of practice.*, *OFT Report 697.*

[24] Rasmusen, Eric, J. Mark Ramseyer, and John Wiley (1991), "Naked Exclusion." *American Economic Review*, 81, 1137-1145.

[25] Rey, Patrick and Jean Tirole (2006), "A Primer on Foreclosure." *Handbook of Industrial Organization, Vol. 3,* Mark Armstrong and Michael Porter Eds., North-Holland.

[26] Rey, Patrick and Thibaud Vergé (2002), "Resale Price Maintenance and Horizontal Cartel." *CMPO Working Paper* 02/048.

[27] Rey, Patrick and Thibaud Vergé (2004), "Bilateral Control with Vertical Contracts." *Rand Journal of Economics,* 35, 728-746.

[28] Segal, Ilya and Michael Whinston (2000), "Naked Exclusion: Comment." *American Economic Review*, 90, 296-311.

[29] Segal, Ilya and Michael Whinston (2003), "Robust Predictions for Bilateral Contracting with Externalities." *Econometrica*, 71(3), 757-791.

[30] Shaffer, Greg (1991), "Slotting Allowances and Resale Price Maintenance: A Comparison of Facilitating Practices." *Rand Journal of Economics,* 22, 120-136.

[31] Shaffer, Greg (2005), "Slotting Allowances and Optimal Product Variety." *Advances in Economic Analysis & Policy*, 5(1), Article 3.

[32] Stole, Lars and Jeffrey Zwiebel (1996), "Intra-firm Bargaining and Non-binding Contracts." *Review of Economic Studies*, 63, 375-410.