Buyer Power and Intrabrand Coordination*

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January 2008

Abstract

We analyze the competitive effects of vertical contracts in a contracting situation where rival retailers offer contracts to a manufacturer. In contrast to Bernheim and Whinston (1998), who study the situation in which competing manufacturers offer contracts to a common retailer, we find that two-part tariffs (even if contingent on exclusivity or not) do not suffice to implement the monopoly outcome. Richer arrangements (including, e.g., conditional fixed fees and upfront payments) are thus required to internalize all contracting externalities. The welfare implications are ambiguous. On the one hand, richer contracts ensure that no efficient retailer is excluded. On the other hand, they allow firms to maintain monopoly prices despite intrabrand competition. Simulations suggest that the latter effect may be more significant.

Keywords: Vertical contracts, 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. This paper was previously circulated under the title "Slotting Allowances and Conditional Payments."

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1 Introduction

In recent years, contracts negotiated between manufacturers and retailers have become increasingly complex. Supply contracts nowadays tend to include a variety of discounts and lump-sum payments instead of simply stating a uniform unit price. Such contracts are contentious from a competition policy perspective. In particular, upfront payments paid by manufacturers to be included in a retailer's product assortment have triggered heated policy debates.[1] Such payments include slotting fees for access to (sometimes premium) shelf space, 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. The magnitude of such payments is considerable. According to a 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 rebates, and these practices have been at the center of the debate about the 2005 reform of the *1996 Galland Act.* Negotiations between a supplier and its retailers often goes far beyond the discussion of a basic per-unit price. Retailers usually obtain or request various rebates that are most of the time restropective, i.e. usually paid at the end of the quarter or the year. The discount can be related to volume, such as quantity rebates or incentive rebates paid if the annual sales (or turnover) have increased compared to the previous years, or to promotional activities. As mentioned by the supermarket inquiry conducted in 2000 by the UK Competition Commission, *"some suppliers offered rebates for prompt payments and for compliance with certain logistical factors, such as full pallets or lorry loads, and EDI ordering."* 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, quantity rebates or promotion related discounts paid at the end of the year), the French producers' association ILEC claimed 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

[1]See for example the reports by the FTC (2001, 2003) in the U.S. or the Competition Commission (2000, 2007) in the U.K.

allocation of shelf space,[2] advertising or the introduction of new products,[3] listing or pay-to-stay fees are particularly contentious. 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.[4] 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.[5] Real-world evidence indicates that both the incidence and the magnitude of slotting allowances are positively correlated with retailers' buyer power, and that supply contracts often become more complex as buyer power increases.[6]

However, the economic literature has mostly concentrated on situations where the upstream firms had the bargaining power. A first result, derived by O'Brien and Shaffer (1997) and Bernheim and Whinston (1998), is that two-part tariffs suffice to achieve joint profit maximization (interbrand coordination) when rival manufacturers supply a common retailer. In such cases, the retailer plays the role of a "gatekeeper" for consumers and fully internalizes, when wholesale prices are set equal to marginal cost, any contracting externalities. Fixed fees can then be used to share the profit. Because it can choose which product to carry, the retailer gets a strictly positive profit in equilibrium even though the

[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 and Wright (2007)). Fees related to the introduction of a new product may serve risk-sharing, signaling or screening purposes (see Kelly (1991)).

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

[5] See the provisional findings of the groceries inquiry published recently by the Competition Commission (2007).

[6] 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.*"

manufacturers have all the bargaining power in each bilateral negotiation. Nevertheless, common agency always arises in equilibrium because the compensation required by a retailer is fully determined by the rival manufacturer's offer and thus cannot be directly affected by a producer. Perfect interbrand coordination could fail to arise in the presence of contracting externalities, in which case exclusion could even occur. Contracting externalities could arise for example from a restriction on contracts,[7] or from third parties not present at the contracting stage.[8] Although O'Brien and Shaffer (1997) and Bernheim and Whinston (1998) have focused on the case where manufacturers have the bargaining power in their bilateral relations with the common agent, interbrand coordination is still achieved (although the division of profit is now different) when the retailer has the initiative: once again, the retailer plays the role of a "gatekeeper" for consumers and fully internalizes, by setting wholesale prices at cost, any contracting externalities. This also remains the case when offers are private: since manufacturers supply at cost and get their remuneration through fixed fees, there is no scope for opportunism. Inderst (2005) also looks at the role of buyer power and slotting allowances 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 thus transforming de facto upstream competition into an auction where manufacturers bid on slotting allowances.

Perfect (intra-brand) coordination remains feasible with simple two-part tariffs whenever a common producer supplying rival retailers chooses the terms of the contracts. It can 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. Note however that this result only holds when offers are public, since private contracting may induce the manufacturer to behave opportunistically. When making an offer to a retailer, the manufacturer does not take into account the impact that the offer will have on the sales of competing retailers; it thus has incentives to free-ride on the other retailers' downstream margin. As shown by Hart and Tirole (1990) and McAfee and Schwartz (1994) in the case of Cournot downstream competition, and by O'Brien and Shaffer (1992) and Rey and Vergé (2004) in the case of Bertrand competition, this prevents the manufacturer from sustaining the monopoly outcome. Rey and Vergé (2004) also show that (under passive beliefs) the problem might be so important that no common agency exists when the retailers are close competitors.[9]

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

[8]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).

[9]McAfee and Schwartz (1995) were the first to notice a (though very different) non-existence issue when the number of retailers increases. Segal and Whinston (2003) note a similar existence problem when

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. Assuming that the manufacturer eventually decides how much to supply, they find that both retailers may be active in equilibrium but there always remains some retail competition; full intrabrand coordination is therefore impossible. 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 latest development in this strand of literature is due to Marx and Shaffer (2007) who consider a model of vertical negotiations where retailers have the initiative in determining the terms of the contracts and the quantities ordered. They 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 fees, paid by the retailer only if it eventually buys from the manufacturer. Indeed, in any candidate common agency equilibrium, the manufacturer must be indifferent between accepting both offers or only one retailer's offer, otherwise that retailer could offer a smaller fixed fee. However, 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 (since sales would expand and retail margins are positive whenever retail competition is imperfect, due, e.g., to differentiation, competition in quantities or capacity constraints). The retailer thus has an incentive to deviate to an exclusive dealing situation.[10] Marx and Shaffer (2007) then show that a large conditional payment can be used to achieve exclusivity (if the manufacturer were to decide to accept both offers or to sell the rival's product, it would have to forego this large payment), while the slotting fee is used to share profit. Their analysis suggests that upfront payments can play a key role in foreclosure strategies, slotting fees being used as a way to get around existing legislation against explicit exclusive dealing contracts.

In contrast to Marx and Shaffer (2007), we show in this paper that foreclosure does not arise when retailers can offer contracts that are contingent on whether the retailer gets exclusivity or not. Assuming, as in Bernheim and Whinston (1998), that contracts can be contingent on the market structure might be a reasonable assumption in the context of relationships between a manufacturer and its retailers. First, one might indeed expect firms to discuss the terms for both options. Second, even when firms negotiate a non-

the manufacturer faces nonconstant returns to scale. See also Rey and Tirole (2007) for an overview of this literature.

[10]Note that the coordination problem that arises in this setting is similar to that faced by a single producer offering secret contracts to competing retailers.

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.[11] In a framework similar to that of Marx and Shaffer (2007), where rival retailers offer public take-it-or-leave-it contingent contracts to a single manufacturer, we study the role of conditional (and upfront) payments in determining: (*i*) whether exclusion is a profitable strategy for a retailer, and (*ii*) the price levels 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.

As we have already mentioned earlier, two-part tariffs would suffice to achieve the industry monopoly outcome if the manufacturer had the bargaining power in each bilateral negotiation with the retailers. 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 lower its (wholesale) price and free-ride on its rival's downstream margin. By reducing the profits that can be achieved, this free-riding may moreover lead to the exclusion of a retailer.

Conditioning fixed fees on actual trade contributes to protect retailers against such free-riding since retailers can then "opt out" and waive the fixed fee if a rival tries to undercut them. Upfront payments by the manufacturer can then be used to give ex ante each retailer its contribution to the industry profits. Last, as we will see, each retailer can discourage its rivals from deviating to exclusivity by making its non-exclusive offer sufficiently more attractive than the exclusivity option.

We moreover show that upfront payments are not necessary to achieve full intrabrand coordination. What really matters is the ability of retailers to protect themselves against attempts to free-ride on their downstream margins, not the possibility to use slotting allowances. Conditioning fixed fees on actual trade provides such a guarantee, but another possibility would be to condition fixed payments on the retailer's ability to sell more than some minimum quantity, in which case negative upfront payments are no longer required. This result holds in our model with contingent contracts, but also in the setting analyzed by Marx and Shaffer (2007), in which only non-contingent offers are allowed. The strong retailer can exclude the weak retailer by means of contract offers that do not include any negative upfront payments. An important policy implication for competition authorities is that banning slotting allowances can be expected to be ineffective, since retailers could circumvent the ban by using an other form of (more sophisticated but legal) supply contract and still achieve the same outcome.

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

The paper is organized as follows. Section 2 outlines the general framework and derives upper bounds on retailers' rents, which provide benchmarks for the rest of the analysis. Section 3 shows that, in contrast to the polar case of upstream competitors dealing with a common retailer, two-part tariffs do not suffice to maximize industry profits. We show moreover that contracting externalities might be so high that only exclusive dealing equilibria exist. In section 4, we consider more general tariffs and first characterize contingent three-part tariffs that generate the industry-profit maximizing outcome. We then show how the same outcome can be replicated even if negative payments (i.e., payments by the manufacturer to a retailer) are ruled out. Finally, section 5 discusses some policy implications of our findings and concludes.

2 Framework and Preliminary Results

2.1 Framework

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

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

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

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

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

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

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

to:

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

When only R_i is active, the maximum profit is:

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

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

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

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

Second, we have assumed that contracts are public. Since the manufacturer observes both offers, no problem of opportunism arises in the first two stages. However, if retailers did not observe each other's 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.

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) and Bedre (2006), who use Stole and Zwiebel's (1996) model of sequential bilateral bargaining, with renegotiation ("from scratch") in a case a relationship breaks-down. De Fontenay and Gans (2005a) consider secret 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.[14] In contrast, Bedre (2006) shows that public contracts combining upfront payments and conditional fixed fees, but not necessarily contingent on exclusivity, achieve joint-profit maximization. Non-renegotiable contingent contracts however allow the first contracting retailer to obtain a larger share of the profits (at the expense of the other retailer) than non-contingent contracts subject to renegotiation.

[14]De Fontenay and Gans (2005b) use a similar approach to study the impact of vertical integration.

2.2 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 the bilateral monopoly profit Π_i^m and share it as desired.[15] We denote by Π^C the equilibrium industry profit 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 profit Π^M; it may however be lower if contracting externalities prevent joint profit maximization.

In any common agency equilibrium, the joint profit of a given vertical pair $R_i - M$ cannnot be lower than the bilateral profit it could achieve by excluding R_{-i} since R_i could otherwise profitably deviate by offering an exclusive dealing contract generating the bilateral monopoly profit and leaving a slightly higher payoff to M.[16] Conversely, there is no profitable deviation to exclusivity 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. Since individual rationality also requires $\pi_i^C \geq 0$ for all i, condition (2) implies that a

[15] 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.

[16] 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.

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

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

We can further reduce the set of possible equilibrium payoffs by restricting attention to trembling-hand perfect equilibria, thus ruling out exclusive offers that would be unprofitable if mistakenly accepted. In particular, the manufacturer must be indifferent between accepting both offers (common agency) or accepting one of the exclusive offers only. Since the profit realized in an exclusive deal with R_2 cannot exceed Π_2^m, this is the maximum that M can obtain in any trembling-hand perfect equilibrium. Therefore, if there exists a (trembling-hand perfect) common agency equilibrium generating industry profits equal to Π^C, the different parties' profits must satisfy:

$$\pi_M^C \in \left[\Pi_1^m + \Pi_2^m - \Pi^C, \Pi_2^m\right], \ \pi_1^C \in \left[\Pi_1^m - \Pi_2^m, \Pi^C - \Pi_2^m\right] \text{ and } \pi_2^C \in \left[0, \Pi^C - \Pi_1^m\right]. \tag{4}$$

3 Two-Part Tariffs

In this section, we consider two-part tariffs that are contingent on the market structure (common agency or exclusivity), of the form:

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

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

3.1 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 profit with M, thus generating a total profit equal to Π_i^m. The fixed fee U_i^E can then be used to share this profit as desired. As a result:

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

- *If $\Pi_1^m > \Pi_2^m$, in any such equilibrium R_1 is the active retailer while R_2 gets zero profit; among these equilibria, the unique trembling-hand perfect equilibrium, which is also the most favorable to the retailers, yields $\Pi_1^m - \Pi_2^m$ for R_1 and Π_2^m for M.*

- *If* $\Pi_1^m = \Pi_2^m$*, there exist two exclusive dealing equilibria, where either retailer is active. In both cases, retailers 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 profit 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, $\Pi_1^m - \Pi_2^m$.[17]

3.2 Common Agency

For the sake of exposition, we assume from now on that, for any pair of wholesale prices (w_1, w_2), there is a unique retail equilibrium and 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 $\Pi(w_1, w_2)$.

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

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

below their monopoly levels. Wholesale prices above cost could however be used to offset the impact of retail competition. In what follows, we assume that high enough wholesale prices would indeed sustain the monopoly outcome:[18]

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.[19] 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).

More generally, this reasoning implies that, in any equilibrium where both retailers are active, the wholesale price w_i^C must maximize the bilateral profit 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:

$$w_i^C = W_i^{BR}(w_{-i}^C), \text{ for } i = 1, 2, \tag{5}$$

[18] 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.

[19] 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.

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

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

The system (5) 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 (5) has at least one solution:[20]

Assumption A3. (i) For $i = 1, 2$, $\Pi(w_1, w_2) - \pi_{-i}(w_1, w_2)$ is quasi-concave in w_i and achieves its maximum for $w_i = W_i^{BR}(w_{-i})$; and (ii) the system (5) has at least one solution.

In what follows, we denote by $(\widetilde{w}_1, \widetilde{w}_2)$ a solution of the system (5) 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 $\widetilde{\Pi} < \Pi^M$.[21]

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 2.2, both retailers can be active only if this generates higher profits than exclusive dealing, that is, if:

$$\widetilde{\Pi} \geq \Pi_1^m. \tag{6}$$

Since $\widetilde{\Pi} < \Pi^M$, condition (6) may be violated, in which case it cannot be that both retailers are active in equilibrium, even though a fully integrated structure would opt for both of them to be active.

Conversely, with contingent tariffs, condition (6) guarantees the existence of an equilibrium in which both retailers are active and each of them 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 $\pi_M^C = \Pi_1^m + \Pi_2^m - \widetilde{\Pi} > 0$,

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

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

- $w_i^E = c$, 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 profitably deviate 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 $\widetilde{\Pi} \geq \Pi_1^m$), it is preferred by both 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 contracts are restricted to (contingent) 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, in contrast to the case of non-contingent contracts studied by Marx and Shaffer (2007) both retailers may well be active in equilibrium.[22] 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. Contingent two-part tariffs however do not allow the retailers to use their common supplier

[22]Moreover, at least one pure strategy equilibrium exists even we restrict our attention to two-part tariffs.

so as to coordinate their behavior in the product market, and industry profits are thus never maximized.

Let us now focus on common agency equilibria (i.e. restricting attention to $\widetilde{\Pi} \geq \Pi_1^m$) and compare the equilibrium retail prices with the industry profit maximizing prices ("monopoly prices"). In order to compare these prices, we make additional assumptions on the profit functions:

Assumption A4. Wholesale prices are strategic complements (i.e., $\left(W_i^{BR}\right)' > 0$), the wholesale price equilibrium 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.

In any common agency equilibrium, 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:

Proposition 3 *Under assumption A4, when contracts are restricted to (contingent) two-part tariffs, retail prices are lower than monopoly prices in any common agency equilibrium.*

4 Non-Linear Tariffs

As shown in the previous section, contingent two-part tariffs do not suffice to ensure the existence of a common agency equilibrium. Moreover, even when such an equilibrium exists, industry profits are not maximized. We now show that restricting attention to two-part tariffs is not innocuous, and try to understand which ingredients are necessary in order to achieve monopoly prices and profits. In particular, as we will see, even relatively simple tariffs suffice to sustain a common agency equilibrium with monopoly prices. Moreover, the retailers' preferred equilibrium is then one where both retailers sell at monopoly prices.

4.1 Large Responses to Small Deviations

We first note that retailers cannot achieve full coordination as long as, as in the case of two-part tariffs, an attempt by one retailer to change its quantity induces a smooth adjustment of its rival's behavior on the downstream market.[23] To see this, 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. When R_i deviates and modifies the contracts it offers to M, the retail equilibrium, i.e. the quantities sold on the downstream market by both retailers are affected. However, since it is always possible to modify the implemented tariff T_i^C so as to induce a quantity q_i (e.g. through simple "point tariffs" specifying a fixed price for an imposed quantity), it is simpler to consider the impact of a change in q_i (rather than T_i) on R_i and M's joint profits, π_{R_i-M}. Assuming that R_{-i}'s reaction function $q_{-i}^{BR}(q_i)$ is differentiable, this change writes as:

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

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

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

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 profit 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.

4.2 Three-Part Tariffs

Such a discontinuous change can be achieved in our framework by "three-part tariffs" that combine classic two-part tariffs with conditional fixed payments. These tariffs, used by Marx and Shaffer (2007) to show that general enough (but non-contingent) non-linear

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

tariffs lead to exclusivity, differ from two-part tariffs only through the fact that part of the fixed fee is conditional on actually buying the product. The tariffs are of the form:

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

where F_i^k denotes the conditional fee paid by the retailer only if it actually buys a positive quantity from the manufacturer.

With such contracts, a "large" (i.e. discontinuous) reaction by R_{-i} can be achieved by setting the conditional fee F_i equal to the retail profit expected from product i. Retailers' profits, gross of the upfront payments, are then zero in equilibrium. Any attempt by R_i and M to free-ride on R_{-i}'s sales, would induce R_{-i} to opt out (i.e., q_{-i}^{BR} drops to zero) and waive the fee F_{-i}^C. This renders such deviation unprofitable for R_i and M. In what follows, we show that tariffs of this form suffice indeed to create the necessary discontinuity in the retailers' behavior and implement the industry monopoly profit Π^M. Such tariffs also 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 obtain their contributions to the industry profits through upfront payments;
- $w_i^C = \overline{w}_i$, so that wholesale prices sustain 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 $F_i^E + U_i^E = \Pi_1^m + \Pi_2^m - \Pi^M$,[24] 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 profit by accepting either one or both offers), and accepting both contracts induces the retailers to implement the monopoly outcome. Wholesale prices generate monopoly prices and quantities if both retailers buy at these prices, and they are indeed willing to buy since conditional payments do not exceed their corresponding profits. Finally, the upfront payments give each retailer its contribution to joint profits.

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

[24] 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.

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

- 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 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 each retailer R_i then pays a wholesale price equal to $\overline{w}_i$ for each unit it buys as well as a conditional fee equal to its variable profit $\pi_i^C(\overline{w}_1, \overline{w}_2)$.

Conditional payments can hence be used to protect retailers against rivals' opportunistic moves:[25] if a retailer deviated to a lower wholesale price, then its 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 all of the retailers' variable profits); therefore, to get their share of the profit, retailers must receive down payments from the manufacturer (i.e., $U_i < 0$).[26] Proposition 4 thus shows how slotting allowances or other forms of down payments can contribute to eliminate retail competition.

[25] 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.

[26] 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 offers and are therefore not trembling-hand perfect.

Our results differ from those obtained in bidding games considered by Martimort and Stole (2003) or Segal and Whinston (2003), where, as here, downstream firms offer non-linear contracts to a common supplier, but it is the supplier that eventually chooses the quantities to procure. Contracting externalities then always generate an inefficient outcome for the firms. The reason is that, when the quantity q_i is chosen by M rather than by R_i, the negotiation over $T_i(.)$ has no effect on q_{-i}. Indeed, while retailers' marginal revenue depend on each other's quantities, the supplier's profit is separable in q_1 and q_2 :

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

whenever the cost function is separable in q_1 and q_2 (i.e. $C(q_1, q_2) = C_1(q_1) + C_2(q_2)$).[27] 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. 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 maximizes its joint profit, which results in the same equilibrium prices.[28]

Our results also differ from those obtained by Marx and Shaffer (2007) who look at the same situation as we do but restrict attention to non-contingent contracts. As already noted in the introduction, when retailers offer non-contingent (three-part) tariffs, the manufacturer is indifferent (in any common agency equilibrium) between accepting both offers or accepting one offer only, whereas the retailer would strictly prefer to break that indifference in favor of exclusivity (since fixed payments remain the same but variable

[27](Dis-)economies of scale or scope would however remove this separability. In contrast, congestion problems or other negative externalities 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}).

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.

[28]More precisely, prices will be the same as in "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 – 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.

profits are greater). In contrast, contingent contracts allow both M and R_i to be indifferent between exclusivity or common agency (in the equilibrium mentioned in proposition 4, they jointly get Π_i^m in both cases), which removes any incentives to deviate to exclusive dealing. 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.[29]

4.3 Ruling Out Negative Payments

In the previous section, we focused on three-part tariffs but other payment schemes could achieve similar effects:

- A non-linear tariff of the form $T_i(q_i) = \rho_i\left(q_i, q_{-i}^M\right) q_i + U_i$, where as before $\rho_i(q_i, q_{-i})$ denotes R_i's revenue function and $U_i \leq 0$ represents an upfront payment by the manufacturer, would also work. Any attempt by R_{-i} to free-ride on R_i's sales would induce R_i 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 can also yield the monopoly outcome. Suppose for example that the wholesale and (imposed) retail prices are both equal to the monopoly price $\left(w_i = p_i = P_i\left(q_i^M, q_{-i}^M\right)\right)$. This eliminates downstream margins and prevents each $R_i - M$ pair from free-riding on R_{-i}'s margin. In this way, the manufacturer recovers all the industry profits, which can be redistributed through upfront payments.[30]

[29] 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. Mouraviev (2007) analyzes a simplified framework (where the parties decide whether to enter into a relationship) that supports this conjecture.

[30] O'Brien and Shaffer (1992) make a similar point. In a situation where a manufacturer offers secret contracts to two competing retailers, they show that resale price maintenance allows the manufacturer to eliminate any risk of opportunism by eliminating downstream margins.

These alternative solutions all involve down payments from the manufacturer to the retailers.[31] However, as we will see now, negative payments are not necessary: even if tariffs are restricted to be non-negative (i.e., $T_i^*(q) \geq 0$ for any q), there exist common agency equilibria with monopoly prices, in which each retailer earn its contribution to the industry profits.

Suppose for simplicity that retailers compete à la Cournot in the downstream market and define $\widetilde{\pi}_i\left(q_i, q_{-i}\right) = \rho_i\left(q_i, q_{-i}\right) - cq_i$. Assume further that $\widetilde{\pi}_i$ is continuous, concave in q_i, decreasing in q_{-i} and that quantities are strategic subsitutes, i.e., $\frac{\partial^2 \widetilde{\pi}_i}{\partial q_i \partial q_{-i}} < 0$. By construction, $\widetilde{\pi}_i\left(0, q_{-i}^M\right) = 0$, and $\Pi^M - \widetilde{\pi}_i\left(q_i^M, q_{-i}^M\right) = \rho_{-i}\left(q_{-i}^M, q_i^M\right) - cq_{-i}^M < \Pi_{-i}^m$ implying that $\widetilde{\pi}_i\left(q_i^M, q_{-i}^M\right) > \Pi^M - \Pi_{-i}^m$. By continuity, it follows that there exists a unique $\widehat{q}_i \in \left]0, q_i^M\right[$ such that $\widetilde{\pi}_i\left(\widehat{q}_i, q_{-i}^M\right) = \Pi^M - \Pi_{-i}^m$. Consider now the following contracts (for $i = 1, 2$):

- If both contracts are accepted (common agency), the relevant tariff takes the following form:[32]

$$T_i^C(q) = \begin{cases} cq & \text{if } q \leq \widehat{q}_i \\ cq + T & \text{if } \widehat{q}_i < q \leq q_i^M \\ +\infty & \text{if } q > q_i^M \end{cases},$$

  where $T = \Pi_{-i}^m - \widetilde{\pi}_{-i}\left(q_{-i}^M, q_i^M\right)$, and is thus positive by construction.

- $T_i^E(q) = cq + \Pi_1^m + \Pi_2^m - \Pi^M$.

The T_i^E allows M to secure its equilibrium profit by dealing exclusively with either retailer, while the tariff T_i^C is very similar in spirit to the three-part tariff used in proposition 4. It is designed to ensure that any attempt to free-ride on R_i's sales by increasing q_{-i} would cause R_i to reduce sharply q_i and thus its payment to M. Suppose first that M accepts both offers and that retailer R_{-i} sells its monopoly quantity q_{-i}^M. Within each range $[0, \widehat{q}_i[$ and $\left]\widehat{q}_i, q_i^M\right]$, R_i obtains the product at marginal cost and would thus be willing to buy up to more than q_i^M. It will therefore buy either $\widehat{q}_i$ or q_i^M. Moreover, it is indifferent between $\widehat{q}_i$ and q_i^M, since in both cases it obtains its contribution to industry

[31] 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 a horizontal agreement rather than a purely vertical contract.

[32] The tariff $T_i^C(q)$ is not only positive but is also such that the manufacturer never sells below cost ($T_i^C(q) \geq cq$). For $q > q_i^M$, $T_i^C(q)$ only needs to be large enough to deter the retailer from selling more than q_i^M (independently of what is done by the rival). For instance, $T_i^C(q) > \rho_i(q_i, 0)$ for $q > q_i^M$ is sufficient if the revenue function ρ_i is decreasing in q_{-i}.

profits:

$$\begin{aligned} \rho_i\left(\widehat{q}_i, q_{-i}^M\right) - T_i^C\left(\widehat{q}_i\right) &= \widetilde{\pi}_i\left(\widehat{q}_i, q_{-i}^M\right) = \Pi^M - \Pi_{-i}^m, \\ \text{and} \quad \rho_i\left(q_i^M, q_{-i}^M\right) - T_i^C\left(q_i^M\right) &= \widetilde{\pi}_i\left(q_i^M, q_{-i}^M\right) - T = \Pi^M - \Pi_{-i}^m. \end{aligned}$$

There thus exists a continuation equilibrium in which each retailer sells its monopoly quantity q_i^M and, together R_{-i} and M obtain Π_{-i}^m, which is exactly the highest profit that they could achieve under exclusive dealing. As we have seen earlier, if R_i's best response to q_{-i} were smooth, the pair $R_{-i} - M$ would be tempted to free-ride on R_i's sales by increasing q_{-i} above q_{-i}^M. However, since $\widetilde{\pi}_i\left(\widehat{q}_i, q_{-i}\right) - \widetilde{\pi}_i\left(q_i^M, q_{-i}\right)$ is increasing in q_{-i}, such a deviation breaks here the indifference of R_i, who immediately reduces its sales to (at most) $\widehat{q}_i$.This reduces the payment to M down to its production cost, making the deviation unprofitable since the joint profit of M and R_i becomes$\widetilde{\pi}_{-i}\left(q_{-i}, q_i\right) \leq \Pi_{-i}^m$. .

Thus, it is indeed the discontinuity in each retailer's reaction function that is important, not the possible use of slotting allowances. The same applies in the context of Marx and Shaffer (2007) with non-contingent tariffs. Since slotting allowances are not used anyway when retailers are equally profitable $\left(\Pi_1^m = \Pi_2^m\right)$, we assume in what follows that $\Pi_1^m > \Pi_2^m$ and show that upfront payments are not needed to achieve exclusivity. As above, it suffices to pick a tariff such that the exclusive retailer is indifferent in equilibrium between the bilateral monopoly quantity and a much smaller one, but would switch to the latter if its rival were active.

We are thus looking for an equilibrium (with non-negative non-contingent tariffs) such that (i) there is exclusion, i.e., only R_1 is active; and (ii) M and R_1 jointly achieve the bilateral monopoly profit Π_1^m, R_1 receiving its full contribution, i.e., $\Pi_1^m - \Pi_2^m$. The following tariffs constitute such an equilibrium:

$$T_1^*\left(q\right) = \begin{cases} cq & \text{if } q \leq \widehat{q}_1 \\ cq + \Pi_2^m & \text{if } q > \widehat{q}_1 \end{cases} \text{ and } T_2^*\left(q\right) = \begin{cases} 0 & \text{if } q = 0 \\ cq + \Pi_2^m & \text{if } q > 0 \end{cases},$$

where $\widehat{q}_1$ is such that $\widetilde{\pi}_1\left(\widehat{q}_1, 0\right) = \Pi_1^m - \Pi_2^m$. Note that such a solution exists and is strictly lower than the bilateral monopoly quantity $q_1^m = \arg\max_q \widetilde{\pi}_1\left(q, 0\right)$.

The tariff T_1^* is designed so that when R_2 is inactive, R_1 is indifferent between $\widehat{q}_1$ and q_1^m. However, since $\widetilde{\pi}_1\left(\widehat{q}_1, q_2\right) - \widetilde{\pi}_1\left(q_1^m, q_2\right)$ is increasing in q_2, if R_2 were to sell a positive quantity, R_1 would no longer be indifferent and would choose to reduce its sales to (at most) $\widehat{q}_1$, thereby sharply reducing its payment to M. M and R_i would then jointly obtain $\widetilde{\pi}_1\left(q_1, q_2\right) < \Pi_1^m$. A similar argument holds for R_2 : when R_1 is inactive, R_2 is indifferent between buying q_2^m and shutting down, but R_2 strictly prefers to shut down whenever R_1 is active. Therefore, if these tariffs are offered, there exists a continuation equilibrium where only R_1 is active and sells q_1^m; whatever set of contracts it accepts, M gets Π_2^m.

If R_1 offers the tariff T_1^*, M and R_2 cannot jointly earn more than Π_2^m (their joint profit is (at best) Π_2^m if only one retailer is active, and $\max_{q_2} \widetilde{\pi}_2(q_2, \widehat{q}_1) < \Pi_2^m$ if both retailers are active). Therefore, there is no profitable deviation for R_2. Suppose now that R_2 has offered the tariff T_2^*. Since R_2 will shut down and withdraw any payment (in particular the conditional fixed fee Π_2^m) to M, R_1 needs to leave at least Π_2^m to the manufacturer in order to be active. It can therefore never obtain more than $\Pi_1^m - \Pi_2^m$, which is exactly what it achieves with T_1^*, making any deviation unprofitable.

5 Policy Implications and Concluding Remarks

Our analysis highlights the role of buyer power in affecting the complexity of contracts that are negotiated between manufacturer and retailers. 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. Our analysis is in line with the observation that retailer buyer power is positively correlated with the growing importance of more sophisticated contracts than simple two-part tariffs. Were bargaining power upstream, the industry monopoly outcome could be achieved with two-part tariffs. Once retailers have some bargaining power, however, two-part tariffs are no longer sufficient to sustain the industry monopoly outcome, which implies that the less efficient retailer may be excluded in equilibrium. More sophisticated contracts are thus needed to maintain monopoly prices and profits.

In particular, these contracts need to be contingent on market structure, otherwise, as noted by Marx and Shaffer (2007), exclusion of the "least profitable" retailer occurs even when general tariff structures can be used. We have shown in this paper, that, 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 using slotting allowances to recover from the manufacturer their contribution to the monopoly profits. Conditioning fixed fees on actual trade serves as a commitment to "opt out" in case prices become too low and thereby prevents deviations.[33] In contrast to Marx and Shaffer (2007), sophisticated tariffs (e.g.

[33] 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.

with slotting allowances) are used to soften retail competition and generate monopoly prices instead of to exclude the rival retailer.

However, three-part tariffs are not the only way to achieve the monopoly outcome: more general non-linear tariffs or two-part tariffs combined with resale price maintenance could generate the same outcome. More importantly, slotting allowances are not needed to obtain the result. Contingent tariffs with conditional payments payable only if the retailer buys more than some threshold quantity can achieve the integrated monopoly solution, even if one insists on these tariffs being non-negative for all quantities. Similarly, if contracts are restricted to be non-contingent, exclusion always occurs, but, once again, slotting allowances are not needed to generate the result.

These results have important implications for competition policy. In particular, they suggest that competition authorities should adopt an effects-based rather than a form-based approach. The latter might lead authorities to ban slotting allowances on the grounds that they harm consumers, either by generating monopoly prices or by allowing the most profitable retailer to exclude its rival in the case of non-contingent contracts. Such a ban can however be expected to be ineffective, since firms would sustain the same equilbrium outcome through other types of tariffs.

Finally, even if some "regulation" were to be introduced, how to design such intervention is a rather complex issue since it is not simple to compare the welfare effects of different kinds of tariffs. In order to illustrate this point, let us compare the equilibrium outcomes with two-part tariffs to the ones with three-part or more general tariffs. For the sake of exposition, we will focus on equilibria that are Pareto-undominated for the retailers.[34] Three-part tariffs (combining conditional fixed fees with 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 contribution to the industry monopoly profits. We now consider the impact of these tariffs on the manufacturer, consumers, and total welfare.

When general enough tariffs are allowed, retailers leave $\Pi_1^m + \Pi_2^m - \Pi^M$ to the manufacturer. When instead firms can only negotiate over two-part tariffs, the equilibria that are Pareto-undominated for the retailers leave either Π_2^m or (provided that $\widetilde{\Pi} \geq \Pi_1^m$)

[34]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.

$\Pi_1^m + \Pi_2^m - \widetilde{\Pi}$ to the manufacturer. Sophisticated tariffs (e.g., slotting allowances) thus unambiguously reduce the manufacturer's profit, since $\Pi^M > \Pi_1^m$, and:

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

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

The impact of sophisticated contracts on consumer surplus and total welfare is more ambiguous. On the one hand, if both retailers carry the manufacturer's product anyway (i.e. when $\widetilde{\Pi} \geq \Pi_1^m$), *reducing competition* harms consumers and thus reduces total welfare. On the other hand, if sophisticated tariffs *avoid* the complete *elimination of a competitor*, they are socially desirable.

To assess further the desirability of general tariffs, it is therefore necessary to identify factors that influence whether exclusion is likely or not, which hinges on the comparison between $\widetilde{\Pi}$ and Π_1^m. One would expect $\widetilde{\Pi}$ to be higher than Π_1^m when the retailers are highly differentiated. Indeed, if the retailers are in 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, $\widetilde{\Pi} > \Pi_1^m$, implying that both retailers can be active even if only two-part tariffs can be used. If instead retailers are perfect substitutes, $\widetilde{\Pi} < \Pi_1^m = \Pi^M$, implying that exclusion necessarily occurs when general tariffs are ruled out. Banning sophisticated tariffs is therefore more likely to induce exclusion when products are less differentiated.

A similar analysis can be carried out concerning the relative strengths of the retailers: the inequality $\widetilde{\Pi} < \Pi_1^m$ is more likely to hold when one retailer contributes much more than the other to the industry profit (that is, Π_1^m close to Π^M); thus, 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 with two-part tariffs, for the cases of quantity (bold line) and price (dashed line) competition.

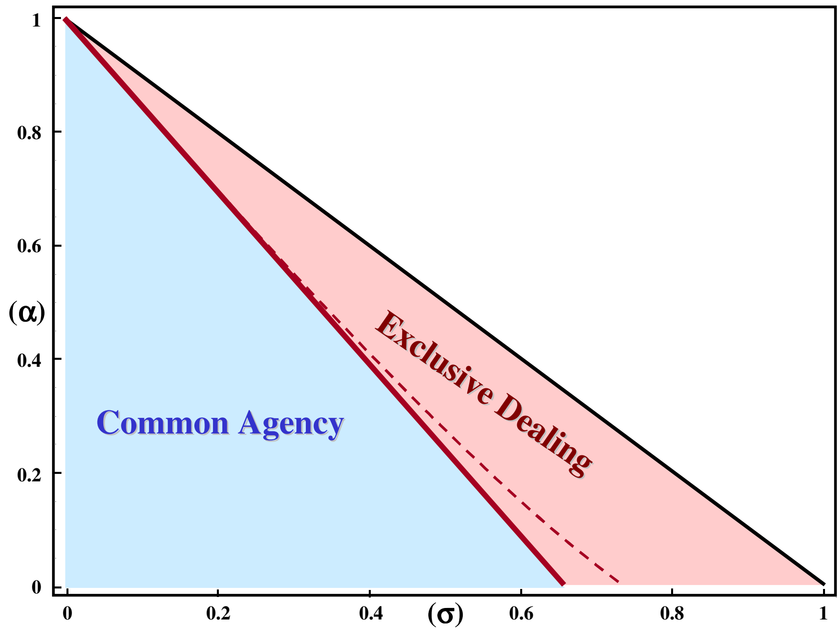

Figure 1: Pareto-undominated equilibrium outcomes with two-part tariffs

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 where both retailers are active. Figure 1 also shows that 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: $\widetilde{\Pi}$ is higher, and thus more likely to exceed Π_1^m, in the case of price competition.

Figure 2 shows the impact on consumer surplus of a restriction to two-part tariffs for the case of quantity competition (results are qualitatively the same for price competition and for total welfare).

Restricting attention to two-part tariffs harms consumers (and society) when it leads to 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

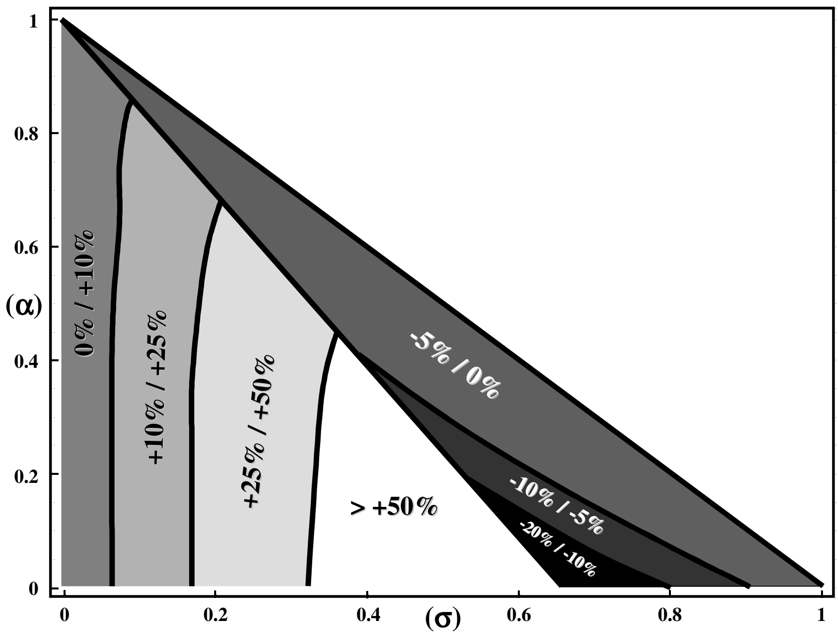

Figure 2: Impact of consumer surplus of a restriction to two-part tariffs

magnitude of such harm tends to be lower than that of the benefits of having somewhat competitive prices when two-part tariffs do not generate exclusion.

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