Resale Price Maintenance and Interlocking Relationships*

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Abstract

An often expressed idea to motivate the per se illegality of RPM is that it can limit interbrand as well as intrabrand competition. This paper analyzes this argument in a context where manufacturers and retailers enter into interlocking relationships. It is shown that, even as part of purely bilateral vertical contracts, RPM indeed limits the exercise of both inter- and intra-brand competition and can generate industry-wide monopoly pricing. The final impact on prices depends on the extent of potential competition at either level as well as on the manufacturers' and retailers' influence in determining the terms of the contracts. Our analysis sheds a new light on ongoing legal developments and is supported by recent empirical studies.

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1 Introduction

The attitude of competition authorities and courts towards vertical restraints varies significantly from one country to another or from one period to another.[1] Still, a consensus emerges against resale price maintenance (RPM), a restraint according to which the manufacturer sets the final price that retailers charge to consumers. While competition authorities are sometimes tolerant towards some variants of RPM such as price ceilings and recommended or advertised prices, they usually treat price floors and strict RPM as per se illegal. For example, when the European Commission adopted a more open attitude towards non-price restrictions, it maintained RPM on a black list – with only one other restraint. In France, price floors are per se illegal and, in *Lypobar vs. La Croissanterie* (1989), the Paris Court of Appeal ruled that RPM was an abuse of franchisees' economic dependency. A recent exception to this consensus concerns the U.S., where the Supreme Court overturned last year the long-established *per se* illegality of price floors, adopting instead a rule of reason approach.[2]

The economic analysis of vertical restraints is more ambiguous: it is not clear that RPM has a more negative impact on welfare than other vertical restraints that limit intrabrand competition. Instead, both price (e.g., RPM) and non-price restraints (e.g., exclusive territories) may have positive or negative effects on welfare, depending on the context in which they are used.[3] In particular, both price and non-price vertical restraints can deal with vertical coordination problems.[4] For instance, combined with non-linear wholesale tariffs, RPM or exclusive territories can equally limit free-riding problems created by strong intrabrand competition.[5] Quite a few papers have moreover pointed at specific efficiency benefits of RPM.[6] Vertical restraints may also affect interbrand competition. Manufacturers can for example impose restraints on retailers so as to become "less aggressive". Through strategic complementarity, this in turn induces their rivals to respond less aggressively (e.g., increase their wholesale prices) ultimately leading to

[1]For an overview of the legal frameworks regarding vertical restraints, see OECD (1994) or the European Commission's *Green Paper on Vertical Restraints* (1996). Comanor and Rey (1996) also compares the evolution of the attitudes of the U.S. competition authorities and within the European Community.

[2]See *Leegin Creative Leather Products, Inc. v. PSKS, Inc.,* 127 S.Ct 2705 (2007).

[3]See Motta (2004, chapter 6) or Rey and Vergé (2008) for recent surveys of that literature.

[4]Rey and Tirole (1986) offers an overview of the relative merits of price and non-price restrictions in improving vertical coordination.

[5]Note however, that depending on the structure of consumer demand, such restraints may harm or enhance economic welfare. See (among others) Spence (1975), Comanor (1985), Caillaud and Rey (1987), or more recently Schulz (2007).

[6]For example, Marvel and McCafferty (1984) stress that RPM can help manufacturers to purchase certification from reputable dealers. Deneckere, Marvel and Peck (1996, 1997) and Wang (2004) show that RPM can encourage retailers to hold inventories in the presence of demand uncertainty, while Chen (1999) shows that RPM may help controlling retail price discrimination.

higher prices and profits.[7] To achieve this, manufacturers must however give retailers some freedom in their pricing policies. Granting exclusive territories (thus eliminating intrabrand competition) would for example serve this purpose and have an adverse effect on consumer surplus and economic welfare, whereas RPM would have no impact since it also eliminates the retailers' freedom to choose their retail prices. Overall, a comparison of the welfare effects of exclusive territories, RPM and exclusive dealing does not clearly justify a more lenient attitude towards non-price restrictions.[8]

There is however one last argument that has often been made by courts to justify a negative attitude towards price restrictions. For example, in *Business Electronics*, the Supreme Court justified the *per se* illegality of RPM by claiming that *"there was support for the proposition that vertical price restraints reduce inter-brand price competition because they facilitate cartelizing."* This type of argument has been informally used by Telser (1960) and Mathewson and Winter (1998). It was however formalized only very recently by Jullien and Rey (2007) who stress that, by making retail prices less responsive to local shocks on retail cost or demand, RPM yields more uniform prices that facilitate tacit collusion – by making deviations easier to detect.

This paper analyzes this "facilitating practice" argument from a different perspective. We show that, even in the absence of repeated interactions, RPM can eliminate any scope for effective competition when manufacturers and retailers engage in "interlocking relationships", that is, when manufacturers distribute their goods through the same competing distributors. The intuition is relatively simple. In the case of a (local) retail monopoly we know that, through "common agency", competing manufacturers can avoid interbrand competition, e.g., by selling at cost in exchange for a fixed fee: since manufacturers internalize through fixed fees the impact of prices on the retailer's profit, eliminating the upstream margin on one brand transforms a rival manufacturer into a residual claimant on the sales of both brands. As a result, rival manufacturers have incentives to maintain retail prices at the monopoly level, which can be achieved precisely by selling at cost. Simple two-part tariffs therefore suffice to maintain monopoly prices and profits.[9] This is no longer the case when there is competition not only between brands, but also between retailers, which tends to reduce retail margins. Manufacturers then have conflicting incentives: they still want to keep low upstream margins in order to avoid interbrand competition but they need now to increase their wholesale prices in order to maintain high retail prices despite intrabrand competition. As we will see, two-part tariffs no longer suffice to maintain industry profits, and retail prices are instead set below their monopoly level. Manufacturers can however use RPM to eliminate intrabrand competi-

[7] See for example Rey and Stiglitz (1988, 1995) and Bonanno and Vickers (1988).
[8] See Caballero-Sanz and Rey (1996).
[9] See Bernheim and Whinston (1985, 1998) and O'Brien and Shaffer (1997).

tion and restore monopoly prices and profits. In particular, selling at cost (for a fee) still makes rivals internalize (through their own fixed fees) the full impact of their prices on the sales of a manufacturer's brand. At the same time, a manufacturer can now maintain high retail prices for its brand through RPM. Combining two-part tariffs with RPM thus provides a mechanism through which manufacturers can give each other incentives to maintain high retail prices and profits. Both interbrand and intrabrand competition are then totally eliminated, even though contracts (including retail prices) are negotiated on a purely bilateral basis. In the absence of any retail bottleneck (e.g., when there are potential competitors for each retail location), manufacturers clearly benefit from this, since they can appropriate most of the profits that they generate. When instead retailers have market power, manufacturers need to leave them some rents, thus reducing their incentives to deal with both retailers and to maintain monopoly prices. As a result, all channels may not be active and manufacturers may moreover favor lower prices, in order to keep a larger share of an admittedly smaller pie, whereas retailers would instead favor higher retail prices.

Note that the mechanism identified here could not be replicated through other standard means of reducing intrabrand competition, e.g., by granting an exclusive right over some territory. Indeed, RPM allows manufacturers to avoid interbrand competition even when, due to retailers' differentiation strategies, meeting consumer demand makes it undesirable to grant exclusive territories and exclude some of the established retailers.

This paper is closely related to that of Dobson and Waterson (2007), who study a similar bilateral duopoly with interlocking relationships. Assuming that manufacturers use (inefficient) linear wholesale prices, they show that the welfare effects of RPM depend on the relative degree of upstream and downstream differentiation as well as on retailers' and manufacturers' bargaining powers; RPM can be socially preferable when retailers are in a weak bargaining position, because the double-marginalization problems generated by the restriction to linear wholesale prices is more severe in such circumstances.[10] In order to eliminate double marginalization problems and focus instead on the impact of RPM on interbrand and intrabrand competition, we do not restrict attention to linear tariffs but allow for bilaterally efficient (two-part) wholesale tariffs.[11]

Our analysis sheds an interesting light on recent legal developments. While the US Supreme Court recently overturned the per illegality of RPM, in France, RPM, together

[10] In a similar context, Allain and Chambolle (2007) moreover show that non-discriminatory price floors can help maintain high retail prices even when manufacturers can grant secret rebates.

[11] Another difference concerns the equilibrium concept. To reflect different bargaining powers, Dobson and Waterson (2007) assume that wholesale prices are determined by simultaneous pairwise bargaining. This supposes that a manufacturer has two independent divisions, each of them negotiating with one retailer not taking into account the impact of its own negotiation on the other division.

with non-linear wholesale tariffs, has instead raised concerns in markets where multiple producers distribute their goods through the same retailers. For example, in December 2005, the Conseil de la Concurrence (one of the two French competition authorities) condemned brown goods manufacturers *Panasonic*, *Philips* and *Sony* for "vertical collusion" with their wholesalers and retailers. The Conseil de la Concurrence concluded that there was evidence that these manufacturers were actively monitoring retailers in order to ensure that they were actually following their recommended retail prices (this was especially the case for new lines of products) and were pushing wholesalers to refuse to supply retailers that were cutting prices.[12] In similar cases, the major perfume manufacturers (*L'Oréal*, *Chanel*, *Guerlain*, *Dior*, ...) and retailers (*Nocibé*, *Marionnaud*, *Séphora*) were fined a total of 44 million euros, and toy manufacturers (*Chicco*, *Lego*, ...) and retailers (*Carrefour*, *JouéClub*, ...) were fined a total of 37 million euros for the same practices.[13]

Our analysis is also relevant for the ongoing reform of the French competition rules banning below-cost pricing. In order to simplify billing methods and enhance transparency, a law adopted in 1996 defined the relevant cost threshold as the invoice-price paid by the retailer at the time of delivery. As a result, retailers could no longer pass on to consumers many rebates, such as quantity and end-of-year discounts or slotting fees, which do not usually appear on invoices. It has been argued that the regulation was legalizing minimum RPM: the invoice price, determined by the manufacturer's general terms of sales, de facto imposed a minimum retail price eliminating intrabrand competition, and retailers then negotiated "backroom rebates" to maintain their margins. The regulation has been heavily criticized as being responsible for the important price increases that have taken place after 1997, especially for the major national brands present in all supermarket chains. As we will see, our analytical framework supports this claim and has moreover been validated by recent empirical studies of the French bottled water market.[14]

This paper is organized as follows. Section 2 presents our framework, where two rival manufacturers distribute their goods through two competing retailers; this framework allows for interlocking relationships (or "double common agency"): each manufacturer can deal with both retailers, and conversely each retailer can carry both brands. Section 3 provides a preliminary analysis of such double common agency situations: while retail prices are lower than the monopoly price in the absence of RPM, with RPM there exist many equilibria, including one in which retail prices and manufacturers' profits are at the

[12] These three manufacturers were respectively fined 2.4, 16 and 16 million euros. *Panasonic* was later cleared by the Court of Appeal. Other major manufacturers present on the French market were also investigated, but the Conseil de la Concurrence did not find enough evidence to convict them. See Conseil de la Concurrence, decision 05-D-66, December 2005.

[13] See Conseil de la Concurrence, decisions 06-D-04 (March 2006, *Perfumes*) and 07-D-50 (December 2007, *Toys*).

[14] See Bonnet and Dubois (2004 and 2007).

monopoly level. We then endogenize the market structure. Section 4 studies situations with potential competition downstream for each retail location. Both brands are then always present at both retail locations and the previous analysis applies; in particular, when RPM is allowed, there always exists an equilibrium with monopoly prices and profits. Section 5 turns to the case of retail bottlenecks, where manufacturers cannot bypass established retailers. Manufacturers must then leave a rent to retailers to induce them to sell their products; relatedly, they can attempt to eliminate competitors by convincing retailers to reject their rival's offer. As a result, it can be the case that no equilibrium exists where both manufacturers are present in both retail outlets, even though there is demand for each brand at each store. In addition, while there may exist a continuum of equilibria with RPM, equilibria with higher retail prices now involve larger rents for the retailers and lower profits for the manufacturer – implying that manufacturers favor equilibria with rather "competitive" prices. Section 6 discusses the policy implications of our analysis and concludes.

2 The Basic Framework

There are two manufacturers, A and B, each producing its own brand and two differentiated retailers, 1 and 2. Retailers differ, for example, in their location or the services they provide to consumers. If both retailers carry both brands, consumers choose among four imperfectly substitutable "products", each manufacturer producing two of them ($\{A1, A2\}$ and $\{B1, B2\}$, respectively) and each retailer distributing two of them ($\{A1, B1\}$ and $\{A2, B2\}$, respectively).

In order to avoid that one firm - manufacturer or retailer - plays a particular role, we suppose that demand functions are symmetric; for any price vector $\mathbf{p} = (p_{A1}, p_{B1}, p_{A2}, p_{B2})$, any $i \neq h \in \{A, B\}$ and any $j \neq k \in \{1, 2\}$, $D_{ij}(\mathbf{p}) \equiv D(p_{ij}, p_{hj}, p_{ik}, p_{hk})$, where the demand function $D(.)$ is continuously differentiable. In what follows, we will drop the arguments in D_{ij} when there is no risk of confusion, and systematically use subscripts i and h for the two manufacturers, and j and k for the two retailers. The products being (imperfect) substitutes, we suppose that the demand for one product decreases with the price of that product and increases with the other prices:[15] $\partial_1 D < 0$[16] and $\partial_n D > 0$ for $n = 2, 3, 4$. Furthermore, we suppose that direct effects dominate, so that demand decreases if all prices increase: $\sum_{n=1}^{4} \partial_n D < 0$. We also assume that both production and

[15] This assumption seems reasonable but is not always maintained. For example, Dobson and Waterson (2007) consider a linear model where the price of one product decreases when the quantity of *any* product increases. However, their specific assumptions then imply that the demand for one brand in one store decreases when the price of the competing brand increases in the competing store ($\partial_4 D < 0$).

[16] We denote by $\partial_n f$ the partial derivative of f with respect to its n^{th} argument.

distribution unit costs are symmetric and constant, and denote them respectively by c and γ.[17] The industry profit is thus equal to $\sum_{i=A,B} \sum_{j=1,2} (p_{ij} - c - \gamma) D_{ij} (\mathbf{p})$. Throughout the paper, we assume that this industry profit is concave in $\mathbf{p}$, maximal for symmetric prices, $\mathbf{p}^M = (p^M, p^M, p^M, p^M)$ and denote by Π^M this maximum (from now on, we will refer to Π^M as the monopoly profit).

To fix ideas, we assume throughout the paper that the manufacturers have all the bargaining power. We thus consider a two-stage game where at stage 1, manufacturers offer contracts to the retailers, and, at stage 2, retailers compete on the downstream markets.

3 Preliminary Analysis: Intrinsic Double Common Agency

We assume in this section that the market structure is necessarily that of a double common agency, by supposing that the market "breaks down" whenever a retailer refuses to carry a brand. This assumption is admittedly ad-hoc and is only introduced here to present the main intuition in a simple way; it is relaxed in the following sections.[18] As we will see, this preliminary analysis provides an adequate characterization of equilibrium prices and profits when potential competition from alternative distribution channels prevent manufacturers from excluding their rivals and retailers from obtaining any rents (section 4). However, the existence of double common agency equilibria and the distribution of rents become relevant issues when retailers have market power (section 5).

We thus consider in this section the following simple two-stage game G:

- **Stage 1: Upstream competition**

(1 − A) Each manufacturer $(i = A, B)$ proposes a contract to each retailer $(j = 1, 2)$. Contract offers are simultaneous and publicly observable,[19] and consist of a wholesale two-part tariff (w_{ij}, F_{ij}) and, if allowed, of a retail price p_{ij}.[20] Re-

[17] We assume constant returns to scale only for expositional simplicity. The following analysis would remain unchanged when fixed costs are for example taken into consideration; more generally, it should become clear to the reader that the thrust of the argument does not rely on a specific formulation of upstream and downstream costs.

[18] This preliminary analysis is similar in spirit to the "intrinsic common agency" game that Bernheim and Whinston (1985) use to present their main insight.

[19] The observability assumption avoids technicalities such as the definition of reasonable conjectures in the event of unexpected offers, and equilibrium existence problems (see Rey and Vergé, 2004a).

[20] A manufacturer can choose not to offer a contract, by "proposing" prohibitively high wholesale prices or franchise fees.

tailers then simultaneously decide whether to accept or reject the offers, and acceptance decisions are public.

(1 − B) If all offers are accepted, the game proceeds to stage 2; otherwise, the market breaks-down and the game ends with all firms earning zero profits.

- **Stage 2: Downstream competition**

  Retailers simultaneously set retail prices (as imposed by the manufacturer under RPM) for all the brands they have accepted to carry, demands are satisfied and payments made according to the contracts.

The simplifying "market break-down" assumption ensures that manufacturers offer contracts that are acceptable by both retailers, and that retailers never obtain more than their reservation utility, which we normalize to zero.

3.1 Two-Part Tariffs

Let us first suppose that contracts can only consist of two-part tariffs. In the second stage, each retailer $j = 1, 2$ sets its prices p_{Aj} and p_{Bj} so as to maximize its profit, given by $\pi_j = \sum_{i=A,B} (p_{ij} - w_{ij} - \gamma) D_{ij} - F_{ij}$. We assume that there exists a unique retail price equilibrium for any vector of wholesale prices $\mathbf{w} = (w_{A1}, w_{B1}, w_{A2}, w_{B2})$, and denote by $\mathbf{p}^r(\mathbf{w}) = (p^r_{A1}(\mathbf{w}), p^r_{B1}(\mathbf{w}), p^r_{A2}(\mathbf{w}), p^r_{B2}(\mathbf{w}))$ the equilibrium retail prices, and by $D^r_{ij}(\mathbf{w}) = D_{ij}(\mathbf{p}^r(\mathbf{w}))$ the resulting demand for each product.

In the first stage each manufacturer i chooses wholesale prices w_{i1} and w_{i2}, and franchise fees F_{i1} and F_{i2}, so as to maximize its profit subject to retailers' participation constraints. Since retailers can only accept both offers or earn zero profit, manufacturer i seeks to solve:

$$\begin{array}{cc} & \max\limits_{(w_{ij},F_{ij})_{j=1,2}} \quad \sum_{j=1,2} \left((w_{ij} - c) D^r_{ij}(\mathbf{w}) + F_{ij}\right), \\ s.t. & \sum_{h=A,B} \left(\left(p^r_{hj}(\mathbf{w}) - w_{hj} - \gamma\right) D^r_{hj}(\mathbf{w}) - F_{hj}\right) \geq 0, \text{ for any } j = 1, 2. \end{array}$$

The participation constraints are clearly binding and the program is thus equivalent to:

$$\max_{w_{i1},w_{i2}} \Pi^r_i(\mathbf{w}) \equiv \sum_{j=1,2} \left(\left(p^r_{ij}(\mathbf{w}) - c - \gamma\right) D^r_{ij}(\mathbf{w}) + (p^r_{hj}(\mathbf{w}) - w_{hj} - \gamma) D^r_{hj}(\mathbf{w})\right).$$

In other words, through the franchise fees each manufacturer i internalizes the impact of its pricing decisions on (i) the entire margins $(p_{ij} - c - \gamma)$ on its own product (for $i = 1, 2$) and (ii) the retail margins $(p_{hj} - w_{hj} - \gamma)$ on the rival's product; it therefore ignores the rival's upstream margins $(w_{hj} - c)$. As a result, (symmetric) equilibrium prices are somewhat competitive (i.e., below the monopoly level) whenever the retail equilibrium satisfies weak regularity conditions.

Assumption 1

i) For symmetric wholesale prices ($w_{i1} = w_{i2} = w_i$ *for* $i = A, B$)*, equilibrium retail prices are symmetric:* $p^r_{i1} = p^r_{i2} \equiv \widetilde{p}\,(w_i, w_h)$ *for* $i \neq h = A, B$*, leading to symmetric quantities* $D^r_{i1} = D^r_{i2} \equiv \widetilde{D}\,(w_i, w_h)$*; moreover:*

ii) an increase in all wholesale prices increases retail prices: $\partial_1 \widetilde{p} + \partial_2 \widetilde{p} > 0$*;*

iii) an increase in one manufacturer's wholesale prices decreases the demand for that manufacturer and increases the demand for its rival: $\partial_1 \widetilde{D} < 0 < \partial_2 \widetilde{D}$ *.*

These conditions are for example satisfied when retail prices are strategic complements and direct effects dominate indirect ones.[21] In particular, they are satisfied in the linear demand case analyzed in section 5.

Proposition 1 *Without RPM, under Assumption 1, any symmetric equilibrium of the form* $w_{ij} = w^e$ *and* $p_{ij} = p^e$ *is such that retailers earn zero profit and* $c < w^e < p^e < p^M$ *.*

Proof. See Appendix A. ■

If there were a monopoly at either level, (public) two-part tariffs would instead lead to retail prices equal to monopoly prices. If, for example, a single manufacturer were selling through competing retailers, it would set wholesale prices high enough to induce retail prices at the monopoly level – and could then recover retail margins through franchise fees. Likewise, if a single retailer were acting as a common agent for several manufacturers, as in Bernheim and Whinston (1985), manufacturers would sell at marginal cost, thereby inducing the retailer to adopt monopoly prices, and could recover again profits through franchise fees.

Here, in contrast, the existence of competition at both the upstream and downstream levels maintains retail prices below the monopoly level. This is because, as noted above, manufacturers only take into account the retail margin on their rival's products, and thus fail to account that a reduction in their own prices hurt their rival's upstream profits. If, for example, retailers are pure Bertrand competitors (that is, assuming away any downstream differentiation), they are both active only if wholesale prices are symmetric ($w_{ij} = w_i$), in which case retail prices simply reflect wholesale prices ($p_{ij} = w_i$) and franchise fees are zero, so that manufacturer i's profit reduces to $\Pi^r_i(\mathbf{w}) \equiv (w_i - c - \gamma)\, \hat{D}_i(w_A, w_B)$, where $\hat{D}_i(p_A, p_B)$ represents the demand for product $i = A, B$ when the price of product A (respectively B) is p_A (respectively p_B). The situation is then formally the same as if the two manufacturers were directly competing against each other.

[21] For example, $\partial_1 \widetilde{p} \geq \partial_2 \widetilde{p} \geq 0$ implies $\partial_1 \widetilde{D} < 0$ and $\partial_1 \widetilde{p} > \left(-\lambda_R / \hat{\lambda}_R\right) \partial_2 \widetilde{p} \geq 0$, where λ_R (respectively, $\hat{\lambda}_R$) denotes the impact on demand for the "product" ij of a uniform increase in retailer j's (respectively, retailer k's) prices, implies $\partial_2 \widetilde{D} > 0$.

3.2 Resale Price Maintenance

Suppose now that manufacturers can resort to RPM. Imposing retail prices is then always a dominant strategy for the manufacturers: whatever the strategy adopted by its rival, a manufacturer can always replicate, with RPM, the retail prices that would emerge and the profits it would earn without RPM.

Under RPM, the last stage of the game is straightforward. In the first stage, given the market break-down assumption, if manufacturer h imposes retail prices (p_{h1}, p_{h2}), manufacturer i will choose wholesale prices w_{i1} and w_{i2}, retail prices p_{i1} and p_{i2}, and franchises F_{i1} and F_{i2} so as maximize its profit, given the retailers' participation constraints:

$$\begin{aligned} &\max_{(w_{ij}, p_{ij}, F_{ij})_{j=1,2}} && \textstyle\sum_{j=1,2} \left((w_{ij} - c) D_{ij}(\mathbf{p}) + F_{ij} \right), \\ &s.t. && \textstyle\sum_{h=A,B} \left((p_{hj} - w_{hj} - \gamma) D_{hj}(\mathbf{p}) - F_{hj} \right) \geq 0, \text{ for any } j = 1, 2. \end{aligned}$$

or, since the participation constraints are clearly binding:

$$\max_{(p_{i1}, p_{i2})} \Pi(\mathbf{p}, w_{h1}, w_{h2}) \equiv \sum_{j=1,2} \left((p_{ij} - c - \gamma) D_{ij}(\mathbf{p}) + (p_{hj} - w_{hj} - \gamma) D_{hj}(\mathbf{p}) \right) \tag{1}$$

As before, each manufacturer fully internalizes (through the franchise fees that it can extract from the retailers) the entire margins on its product, but internalizes only the retail margins on the rival's product. But now, the manufacturer's wholesale prices no longer affect its profit (previously, these wholesale prices had an indirect effect through retailers' prices, which are now directly controlled by the manufacturer); however, as the program (1) makes clear, these wholesale prices affect the rival's profit and thus the equilibrium behavior of the competitor. As a result, there usually exists a continuum of equilibria – one equilibrium for every profile of wholesale prices $w = (w_{A1}, w_{B1}, w_{A2}, w_{B2})$.

If for example manufacturer h sells at cost ($w_{h1} = w_{h2} = c$), program (1) becomes:

$$\max_{p_{i1}, p_{i2}} \sum_{j=1,2} \left((p_{ij} - c - \gamma) D_{ij}(\mathbf{p}) + (p_{hj} - c - \gamma) D_{hj}(\mathbf{p}) \right)$$

Manufacturer i then fully internalizes the impact of its retail prices on aggregate profits, and thus sets its prices at the monopoly level if manufacturer h does also so; there thus exists an equilibrium in which both manufacturers set wholesale prices to c and retail prices to the monopoly level, and share monopoly profits. RPM can thus prevent the exercise of interbrand as well as intrabrand competition.[22]

If instead manufacturers adopt wholesale prices above cost, they tend to choose more aggressive retail prices for their own brand, since they do not take into account the upstream margins on the rival brand. As a result, one expects an inverse relation between

[22] The argument still applies when marginal costs are not constant, interpreting c as the marginal cost for monopolistic production levels.

wholesale and retail prices. The next proposition confirms this intuition under the following regularity conditions:

Assumption 2

i) For $w_{h1} = w_{h2} = w_h$ and $p_{h1} = p_{h2} = p_h$, and $i \neq h \in \{A, B\}$, the revenue function Π is single-peaked in (p_{i1}, p_{i2}) and maximal for symmetric prices, $\hat{p}_{i1} = \hat{p}_{i2} = \hat{p}(p_h, w_h)$;

ii) $\hat{p}(.,.)$ satisfies $0 < \partial_1 \hat{p} < 1$ and, for any w, the function $p \to \hat{p}(p, w)$ has a unique fixed point.

This assumption first states that retail price responses are well defined and preserve symmetry; in addition, for any symmetric profile of wholesale prices, there exists a unique, stable, "retail equilibrium" (looking at a reduced strategic game where manufacturers would simply choose retail prices, taking wholesale prices as given). We have:

Proposition 2 *If RPM is allowed then:*

i) There exists a symmetric subgame perfect equilibrium in which wholesale prices are equal to cost ($w^* = c$), retail prices are at the monopoly level $\left(p^* = p^M\right)$, retailers earn zero profit and manufacturers share equally the monopoly profit.

ii) Under Assumption 2, there exists a decreasing function $p^*(.)$ such that, for any w^* there exists a symmetric subgame perfect equilibrium in which wholesale prices are equal to w^*, retail prices are equal to $p^*(w^*)$, and retailers earn zero profit.

Proof. See Appendix B. ■

There is thus a continuum of symmetric equilibria and, within this set of equilibria, retail prices are inversely related to wholesale prices. Retail prices are at the monopoly level when wholesale prices are equal to cost – in this equilibrium, manufacturers thus "eliminate" any competition and achieve monopoly profits – while upstream mark-ups sustain lower retail prices.[23] In essence, with RPM, the situation is one where manufacturers deal with two, non-competing, common agents. Consider for example the polar case where retailers are pure Bertrand competitors (no downstream differentiation). With RPM the manufacturers eliminate retail competition and de facto allocate half of the demand for their products to each retailer; the monopolistic equilibrium then simply mimics the Bernheim and Whinston (1985) common agency equilibrium (without RPM) within each half-market. The above analysis generalizes this insight to the case where retailers are differentiated.

[23] Conversely, negative upstream margins would sustain retail prices above the monopoly level. The range of equilibrium prices depends on the domain of validity of Assumption 2. For example, for the linear demand used in section 5, any retail price from $c + \gamma$ up to the price for which quantities are 0 can be sustained.

- *Bilateral bargaining power*

While we have assumed here that manufacturers have all the bargaining power and make take-it or leave-it offers to retailers, the analysis is similar if retailers are the ones that propose the contracts in stage $1-A$. Suppose for example that retailers have all the bargaining power. With RPM, there again exists an equilibrium in which prices are at the monopoly level – although now the retailers rather than the manufacturers get all the profits. To achieve this, however, instead of removing the upstream margin $(w^* = c)$, the retailers remove the downstream margin $\left(w^* = p^M\right)$, so as to allow each of them to internalize the whole margin on the manufacturers' sales through the other retailer – franchise fees being used to extract the manufacturers' expected revenues (slotting fees - i.e. negative franchise fees - are needed in this setting to transfer profits downstream).

3.3 Effort and Equilibrium Selection

Resorting to RPM generates a coordination problem that does not arise in the context of a single common agent:[24] there exist here (infinitely) many other equilibria, including very competitive ones.[25] While there always exists an equilibrium yielding monopoly profits (even in the absence of Assumption 2), the manufacturers may end up being locked into a "bad" equilibrium.

This multiplicity comes from the fact that manufacturers have more control variables than "needed." Retail prices allow a manufacturer to monitor the joint profits earned together with the retailers, while both franchise fees and wholesale prices can be used to recover retailers' profits. The multiplicity of equilibria then derives from the fact that a manufacturer is indifferent with respect to the level of its wholesale prices, which however drive its rival's decisions. It is thus difficult to draw policy implications, since some equilibria are better and others worse than the equilibrium that would emerge in the absence of RPM.

One way to circumvent this issue is to introduce a (non contractible) retail effort which affects the demand and is chosen by the retailers at the same time as they set prices. To fix ideas, suppose that, at the downstream competition stage, each retailer can increase the demand for a brand it distributes by exerting some costly effort. In contrast

[24] In single common agency situations, several equilibria exist but they only differ on how the manufacturers share the monopoly profit. In particular, there exists a unique *symmetric* equilibrium in two-part (or non-linear) tariffs, which yields the monopoly outcome. However, introducing RPM would again generate a multiplicity of (symmetric) equilibria, since as above each manufacturer would respond to its rival's wholesale price and be indifferent as to its own wholesale price. Introducing RPM in that case is not helpful and even possibly harmful for the manufacturers.

[25] While the previous proposition shows that there exists a continuum of symmetric equilibria, the same logic allows as well to construct equilibria around asymmetric profiles of wholesale prices.

with the previous situation, manufacturers are no longer indifferent as to the choice of their wholesale prices, since they affect retail efforts. There are no longer more control variables than targets, as a consequence, the multiplicity disappears. To provide adequate incentives, manufacturers must make retailers residual claimants for their efforts, which requires wholesale prices equal to marginal cost. As a result, in equilibrium the wholesale prices are always equal to the marginal cost, and the only equilibria that are robust to the introduction of retail efforts therefore lead to the monopoly outcome.[26]

4 Competitive Retailers

The previous "market break-down" assumption imposes double common agency as the equilibrium market structure and moreover implies that manufacturers extract all profits. While this assumption is clearly ad-hoc and, as such, unrealistic, it captures the essential ingredients of potential retail competition. Indeed, if manufacturers can always find equally efficient alternative channels for each relevant retail location then, as in the previous section, the following two features are likely to hold:

- retailers have no bargaining power, so that manufacturers extract all profits;
- manufacturers cannot exclude their rivals from any retail location.

The analysis of the precedent section is then likely to prevail: manufacturers are deemed to "accommodate" each other and their best strategy is to maintain monopoly prices and share the monopoly profits, which they can indeed achieve by adopting common retailers (rather than marketing their products themselves or through different retailers) and eliminating intrabrand competition between these common retailers through RPM.

To capture the absence of retail bottleneck in a simple way, we now interpret D_{ij} as the demand for brand $i = A, B$ at retail location $j = 1, 2$; and assume that, for each retail location, each manufacturer has access to at least one potential alternative, equally efficient retailer. Manufacturers can thus either distribute their products through the established retailers (who can carry both brands) or bypass them and use instead alternative (exclusive) retailers. We denote 1_A, 1_B, 2_A and 2_B the alternative retailers and assume that they face the same retail cost γ as the established retailers. In order to stick as much as possible to the above analysis, we assume that manufacturers first try to deal with established retailers and therefore adapt the competitive game G by modifying the second step of the upstream competition stage as follows:

[26] The complete analysis is available in an earlier version of this paper (Rey and Vergé, 2004b).

($1 - B$) Whenever a manufacturer has an offer rejected by a retailer, it proposes a contract to its relevant alternative retailer. All offers to alternative retailers are again simultaneous and public, as well as their acceptance decisions.

The first step of the upstream competition stage thus still allows the manufacturers to adopt a common retailer at each location, while the second step now captures the absence of retail bottleneck: a manufacturer whose offer is rejected in step $1 - A$ can still market its product through the alternative retailer in step $1 - B$. This, in effect, prevents manufacturers from trying to foreclose their rivals' access to consumers; as we will see, it also encourages retailers to accept any offer that gives them non-negative profits. More generally, alternative retailers need not be exclusive and might well deal with both manufacturers; conversely, manufacturers could also make offers to alternative retailers at stage one as well (see the discussion below). This would not affect the essence of the analysis but would however complicate its exposition, by increasing the number of cases to be considered.

In the absence of RPM, a retailer that chooses to carry a single brand – brand A, say – is likely to face tougher competition, since manufacturer B will then turn to its alternative retailer, who will no longer internalize the impact of its price on brand A. In addition, when dealing with its alternative retailer, manufacturer B will no longer internalize the other retailers' margins (since their fees have already been negotiated). This makes manufacturer B more aggressive (through a lower wholesale price for the alternative retailer), which further tends to result in lower retail prices and downstream profits. As a result, refusing the offer of one manufacturer in step $1 - A$ is therefore likely to make the other manufacturer's offer less attractive and, as in the previous section the retailers' relevant choices are then to accept both offers or none.[27] The proof of proposition 1 then carries over, ensuring that in equilibrium, retailers obtain no rent and prices are somewhat competitive, not only when the manufacturers rely on different retailers in a given local market, but also when they rely on common retailers.

When RPM is allowed, the preliminary analysis outlines a candidate equilibrium where manufacturers share the monopoly profit: in this candidate equilibrium, manufacturers adopt the established retailers as common agents, sell at cost, impose monopolistic retail prices and extract all profits through franchise fees. By construction, no deviation is

[27] Providing general conditions under which mono-branding results in lower retail prices and profits proves cumbersome, but it holds for example in the linear model that we consider in the next section. It holds as well if the "alternative retailer" consists of direct distribution: in that case, the wholesale price goes down to cost and, failing to internalize the impact of its price on the other brand, a mono-brand retailer moreover sets a lower margin than a multi-brand retailer would do. Retail prices and downstream profits are then lower whenever retail prices are strategic complements and the retail equilibrium is stable.

profitable for a manufacturer if retailers keep accepting the rival's offers.[28] However, by deviating and opting for a more aggressive behavior, a manufacturer can now discourage a retailer from carrying the rival brand.[29] In essence, such moves allow the deviating manufacturer to act as a Stackelberg leader: imposing a price below the monopoly level forces the rival to deal with the alternative retailers and therefore to set retail prices that "best respond" to the deviating manufacturer's prices. Such deviations are however unattractive when, as one may expect, Stackelberg profits – which involve some competition – are lower than monopoly profits.

The following proposition confirms this intuition and shows that, under mild conditions, the previous characterization of double common agency equilibrium outcomes still applies in the absence of the "market break-down assumption. To introduce the relevant conditions, we need to consider two hypothetical scenarios of Stackelberg competition: in the first scenario, the leader (respectively, the follower) produces at cost $c + \gamma$ the "products" $A1$ and $A2$ (respectively, $B1$ and $B2$); in the second scenario, the leader produces three products, $A1$, $A2$ and $B1$, while the follower produces $B2$. The first scenario is thus a mere extension of the standard Stackelberg price competition to a symmetric duopoly in which each firm produces and sells two products, while the second scenario involves asymmetric firms.

Assumption 3 *In the two Stackelberg scenarios just described, the leader's average profit is, per product, lower than the monopoly profit.*

In the first scenario, the requirement is satisfied whenever prices are strategic complements: Gal-Or (1985) shows indeed that the leader's profit is then lower than the follower's profit,[30] and since the industry-wide profit cannot exceed the monopoly level, the leader's profit is thus less than half the monopoly profit. Amir and Grilo (1994) note that the comparison between the leader's and the follower's profits is more ambiguous when they are in an asymmetric position, as in the second scenario; however, there is still some competition between the two firms, and since the follower sells one product only, it is likely to be even more aggressive, so that the above requirement sounds again quite reasonable. Assumption 3 is for example always satisfied in the linear case analyzed in

[28] Since each manufacturer gets half the monopoly profit when its offers are accepted by the two retailers, and retailers will not accept offers that yield negative profits.

[29] Retailers will refuse the manufacturer's offer, which involves a franchise fee equal to the monopoly profit (per product), whenever they expect rival prices below the monopoly level.

[30] When prices are strategic complements, the leader (L) is willing to increase its prices in order to encourage the follower (F) to (partially) follow-up and, as a result, in equilibrium L's prices are higher than F's ones; thus, F "best responds" to L's comparatively higher prices, while L does not even best respond to F's lower prices.

section 5 as well as when prices are strategic complements and there is strong intrabrand or interbrand competition.[31]

Assumption 4 *The revenue function* $\pi(p) = (p - c - \gamma) D(p, p^M, p^M, p^M)$ *is maximal for a price lower than* p^M.[32]

Proposition 3 *When RPM is allowed, under Assumptions 3 and 4, there exists a subgame perfect equilibrium where manufacturers adopt common retailers (double common agency) and set wholesale prices to marginal cost* ($w^c = c$) *and retail prices to the monopoly level* $(p^c = p^M)$, *and achieve monopoly profits (that is, retail profits are zero).*

Proof. See Appendix C. ■

The intuition underlying this result is straightforward. It is impossible for a manufacturer to exclude its competitor from any location, since the rival always finds it profitable to deal with its alternative retailer at that location in the second stage. But then, the best way to "accommodate" the rival manufacturer is by adopting RPM and sharing retailers. As noted in the previous section, RPM eliminates competition between the common agents, and common agency "eliminates" competition between the manufacturers.

Two-part tariffs play an important role in the analysis; franchise fees provide an additional instrument for profit-sharing which, in the absence of RPM, avoids double-marginalization problems; with RPM, franchise fees allow manufacturers to extract all retail revenues and thus encourage them to maintain monopoly prices and profits. However, franchise fees are not essential for the argument and other types of contracts would generate a similar analysis. Consider for example royalties instead of franchise fees. In the absence of RPM, they eliminate double marginalization as well and, together with RPM, asking each retailer to pay back to the manufacturer a percentage of its total profit (almost half of it, say) still sustain an equilibrium with monopoly prices.

Proposition 3 extends the insights of Bernheim and Whinston (1985) to the case of "double common agency". Our analyses share two essential "ingredients" that derive from

[31] The second, asymmetric Stackelberg scenario boils down to a symmetric Stackelberg duopoly when there is strong intrabrand and/or interbrand competition. Suppose for example that retailers are perfect substitutes (no downstream differentiation); that is, there is a demand $D_i(p_A, p_B)$ for brand $i = A, B$ and perfect Bertrand competition between stores. Then, in the asymmetric Stackelberg scenario, the leader anticipates that the follower will undercut its price for B (that is, $p_{B2} \leq p_{B1}$) and the analysis is the same as for a standard symmetric Stackelberg duopoly between a leader producing A and a follower producing B.

[32] Since $\pi'(p^M) = D(p^M) + (p^M - c - \gamma)\partial_1 D = -(p^M - c - \gamma)(\partial_2 D + \partial_3 D + \partial_4 D) < 0$ (with all derivatives of D evaluated at $\mathbf{p}^M$), this assumption holds, for instance, if $\pi(p)$ is single-peaked. This is clearly the case in our linear demand example.

some form of potential competition in the downstream market: (i) retailers accept any offer as long as their expected profit is non-negative; and (ii) manufacturers cannot exclude their competitors. This derives here from the manufacturers' ability to use alternative retailers when an offer has been rejected. Other situations sharing the same ingredients (i) and (ii) would yield the same outcome:

- There could be more than one alternative retailer, and these alternative retailers might also carry both brands; in the same vein, the manufacturers could choose which retailer to contact first. Thus for example, the analysis would carry over when in each location there exists a competitive supply of potential retailers, to which the manufacturers propose contracts in turn, until an offer is accepted.

- Another possibility would be to extend the framework of Bernheim and Whinston (1985) to the case of multiple retail locations: we could for example allow manufacturers to make simultaneous (but withdrawable) offers to several retailers before choosing, in each location, (at most) one retailer among those that have accepted an offer.[33]

- Instead of using alternative retailers, a manufacturer could also sell directly to consumers. While establishing its own retail outlet might involve some significant set-up costs, our analysis would carry over as long as those set-up costs do not exceed the additional profit that they would generate, and as long as the marginal cost of direct distribution does not significantly exceed that of established retailers. This alternative might be particularly plausible in sectors where internet sales constitute a good substitute for in-store sales.

The admittedly ad-hoc but simplifying "market break-down" of the previous section is thus not crucial and there exists a wide range of situations for which monopoly prices (through the adoption of common retailers and RPM) constitute a likely outcome. They are indeed many markets with no retail bottlenecks, such as the car retailing sector for instance.

Note finally that, while the equilibrium multiplicity issue still arises here, it is however somewhat less acute than before: some of the previously-described equilibria involve low industry profits and would therefore be destabilized by a manufacturer's attempt to convince established retailers to carry only its own brand – thereby placing this manufacturer in the position of a (admittedly constrained) Stackelberg leader. In addition, the introduction of (arbitrarily small) retail efforts would again single out the equilibrium where retailers are residual claimants – and retail prices are at the monopoly level.

[33] In a previous version of this paper (Rey and Vergé, 2004b), we obtained indeed a similar result using a framework more directly inspired by Bernheim and Whinston's original analysis of common agency.

5 Retail Market Power

We now turn to situations where manufacturers cannot bypass the established retailers. The existence of retail bottlenecks raises two issues. First, a manufacturer can now try to eliminate its rivals, by inducing retailers to carry exclusively its own brand; while this might induce more competitive outcomes, we show that it may also prevent the brands from being offered at both stores – despite the fact that there is demand for each brand at each store. Second, retailers now have some market power and manufacturers must therefore share the profits with them. As a result, while RPM may again allow manufacturers to maintain monopoly prices, they may favor an equilibrium with lower retail prices in order to reduce retail rents – that is, they may prefer more competitive prices, and have a bigger share of a smaller pie.

Assuming that only the two established retailers (1 and 2) can reach consumers, we simply remove the part $(1-B)$ of our game G, i.e., once retailers have decided which contracts to accept, the game always proceeds to stage 2 (downstream competition). In a double common agency situation, manufacturers must now ensure that retailers get at least as much as they could obtain by selling exclusively the rival brand; as we will see, this implies that manufacturers must leave a rent to retailers – that is, they cannot extract all the industry profits, even if they can make take-it-or-leave-it offers.[34]

The existence of these rents – and the fact that they must be evaluated for asymmetric structures too – somewhat complicates the analysis. We could provide a partial characterization of double common agency equilibria for general demand structures, but it is difficult to assess the existence of these equilibria and thus to evaluate the impact of RPM on prices and profits. In order to shed some light, we therefore restrict attention in this section to a linear model where costs are normalized to zero, $c=\gamma=0$, and demand is given by:[35]

$$D_{ij}(\mathbf{p}) = 1 - p_{ij} + \alpha p_{hj} + \beta p_{ik} + \alpha\beta p_{hk},$$

with $\alpha, \beta \geq 0$. The parameter α measures the degree of interbrand substitutability; the demands for brands A and B are independent when $\alpha = 0$ and the brands become closer substitutes as α increases. Similarly, β measures the degree of intrabrand substitutability.[36] To ensure that demand decreases when all prices increase, we suppose

[34] They may be able to reduce retailers' rents by making both exclusive and non-exclusive offers; we rule out this possibility, however, in order to better assess the impact of retail market power.

[35] The expression of the demand is valid as long as all four products are effectively sold. When product ij is not sold (e.g., when the above demand would be negative or when retailer j refuses to carry brand i), the demand for the other products must be evaluated by replacing the price of that product with a virtual price $\bar{p}_{ij}$, computed by equating D_{ij} to zero (i.e., $\bar{p}_{ij} = 1 + \alpha p_{hj} + \beta p_{ik} + \alpha\beta p_{hk}$).

[36] For simplicity, we moreover assume that the parameter that measures the effect of an increase in one price on the demand for the rival brand at the rival store is simply the product of the intrabrand and

$\alpha + \beta + \alpha\beta < 1$.

5.1 Two-Part Tariffs

Starting with the case where RPM is not allowed, we first show that retailers' market power gives them positive rents whenever they carry both brands.

Given a vector of wholesale prices $\mathbf{w} = (w_{A1}, w_{B1}, w_{A2}, w_{B2})$ (with the convention $w_{ij} = \emptyset$ if retailer j does not carry brand i), at the last stage retail competition leads to a vector of equilibrium prices $\mathbf{p}^r(\mathbf{w}) = \left(p^r_{ij}(\mathbf{w})\right)_{i;j}$ (with $p^r_{ij} = \bar{p}_{ij}$ if $w_{ij} = \emptyset$ – see footnote 35) and quantities $D^r_{ij}(\mathbf{w}) = D\left(p^r_{ij}, p^r_{hj}, p^r_{ik}, p^r_{hk}\right)$. A retailer – retailer 1, say – accepts to carry both brands if, by doing so, it earns profits that are not only non-negative, but also higher than what it could obtain by selling only one brand. Therefore in any equilibrium where both retailers carry both products, the contract between A and 1 must satisfy the following constraints:

$$\sum_{i=A,B} ((p^r_{i1} - w_{i1})D^r_{i1} - F_{i1}) \geq \max\left[0, (\tilde{p}_{B1} - w_{B1})\tilde{D}_{B1} - F_{B1}, (\hat{p}_{A1} - w_{A1})\hat{D}_{A1} - F_{A1}\right],$$

where $\tilde{p}_{B1}$ and $\tilde{D}_{B1}$ (respectively $\hat{p}_{A1}$ and $\hat{D}_{A1}$) denote the prices and quantities that result from retail competition when retailer 1 carries only brand B (respectively, brand A).[37]

Removing one brand from one store eliminates one of the available "products", and thus increases the demand for the remaining products. This gives retailer 1 an incentive to raise p_{B1},and the nature of the retail price equilibrium (strategic complementarity of prices, stability of the equilibrium) then implies that, in the new equilibrium, all retail prices are higher. Moreover, in the new equilibrium, retailer 1 makes more profit on product $B-1$ both because of the report from product $A-1$ and of the increase in the rival's prices. Therefore, $(\tilde{p}_{B1} - w_{B1})\tilde{D}_{B1} > (p^r_{B1} - w_{B1})D^r_{B1}$, and a similar argument ensures that $(\hat{p}_{A1} - w_{A1})\hat{D}_{A1} > (p^r_{A1} - w_{A1})D^r_{A1}$. Retailer 1 can therefore guarantee itself a positive profit, and, in a symmetric situation, the retailers' relevant participation constraint is thus:

$$\pi^r(w, w; w, w) - 2F \geq \pi^r(w, \emptyset; w, w) - F \Longleftrightarrow F \leq \pi^r(w, w; w, w) - \pi^r(w, \emptyset; w, w), \quad (2)$$

where $\pi^r(w_{Aj}, w_{Bj}; w_{Ak}, w_{Bk}) = \sum_{i=A,B}\left(p^r_{ij} - w_{ij}\right)D^r_{ij}$ denotes the retail profit (gross of the franchise fees) of retailer j for any vector of wholesale prices (with the convention that $w_{ij} = \emptyset$ if retailer j does not carry brand i).

The analysis carried out in the absence of retail bottlenecks (sections 3 and 4) relies on the premise that retailers' participation constraints are binding in equilibrium. Due to the

interbrand parameters.

[37] These prices and quantities are $\tilde{p}_{B1} = p^r_{B1}(\emptyset, w_{B1}, w_{A2}, w_{B2})$, $\tilde{D}_{B1} = D^r_{B1}(\emptyset, w_{B1}, w_{A2}, w_{B2})$, $\hat{p}_{A1} = p^r_{A1}(w_{A1}, \emptyset, w_{A2}, w_{B2})$ and $\hat{D}_{A1} = D^r_{A1}(w_{A1}, \emptyset, w_{A2}, w_{B2})$.

possible existence of multiple continuation equilibria for a given set of offers complicates the analysis. It can for instance be shown that, when the following inequalities hold:

$$\pi^r(w,w;\emptyset,w)-\pi^r(w,\emptyset;\emptyset,w)<F<\pi^r(w,w;w,w)-\pi^r(w,\emptyset;w,w), \tag{3}$$

there exist two continuation equilibria: one where both retailers carry both brands (double common agency) and in which one retailer carries brand A while its rival carries brand B ("mon-branding"). Such multiplicity may then be used to sustain equilibria of the contracting game in which retailers obtain more than is necessary to meet their participation constraints, by punishing deviating manufacturers through a switch to alternative, worse, continuation equilibria. In the linear model adopted in this section, there exists a threshold $\overline{\beta}(\alpha)>0$, that guarantees that (3) never holds for any $\beta<\overline{\beta}(\alpha)$, thereby ensuring that the retailers' participation constraint must be binding in any (symmetric) common agency equilibrium.

The next proposition shows that, due to retailers' market power, it may be the case that no symmetric equilibrium exists where both retailers carry both brands.

Proposition 4 *For any α, there exists a threshold $\overline{\beta}(\alpha)>0$, such that, without Resale Price Maintenance, there exists no symmetric equilibrium with double common agency for $\beta<\overline{\beta}(\alpha)$.*

Proof. See Appendix D. ■

Even though there is a positive demand for each brand at each store, there often does not exist an equilibrium where both retailers sell both products. The intuition is the following: in equilibrium, each retailer must be indifferent between accepting or refusing to carry each particular brand. A deviating manufacturer (manufacturer A, say) can therefore easily break this indifference and convince one retailer to accept only its own offer, while ensuring that the second retailer continues to carry both brands. It can indeed slightly change its wholesale price to break the indifference between carrying both brands and carrying brand A only (this comparison does not depend on the fixed fee set by manufacturer A), and slightly change its fixed fee to break the indifference between carrynig both brands and carrying brand B only. Since the deviation can be made arbitrarily small, it does not affect the best responses to the other decisions by the rival retailer, and this guarantees that, in any continuation equilibrium, manufacturer B is partially excluded: a retailer then carries both brands while its rival only carries brand A.[38] Such a deviation does (almost) not affect the payments received by manufacturer A

[38] If the deviation is symmetric, there exists two outcome-equilibrium continuation equilibria.

through the fixed fees, but it increases its sales since brand B is not longer carried by one retailer. The deviation is therefore profitable whenever the wholesale margin is positive.

Suppose now that the wholesale margin is non-positive ($w \leq c$) and consider a small (symmetric) deviation by manufacturer A that consists of offering a wholesale price $v = w \pm \varepsilon$ and adjusting its fixed fee to ensure that double common agency is now the unique continuation equilibrium. This can easily be done since the wholesale price (resp. fixed fee) can again be adjusted to break the retailers' indifference towards preferring to carry both brands rather than brand A (resp. brand B) only. Given our linear demand specification, it can be shown that it requires increasing the wholesale price (i.e. $v = w + \varepsilon$, with $\varepsilon > 0$).[39] Such a deviation is thus profitable (when the wholesale margin is positive) when we have:

$$\left.\frac{\partial\left((v-c)\,D^r_{Aj}\,(v,w,v,w)+\pi^r\,(v,w;v,w)-\pi^r\,(\emptyset,w;v,w)\right)}{\partial v}\right|_{v=w}>0,$$

condition which holds for any $\beta < \overline{\beta}\,(\alpha)$.

As a result, and in contrast with the standard single common agent case (i.e., when selling their products through a single retailer), in which there always exists a common agency equilibrium, there does not always exist a "double common agency" equilibrium. The main difference is that the rent that manufacturer i must leave to retailer k now depends on the tariff offered to retailer h, which, among other things, implies that, when deviating towards "de facto exclusive deals", a manufacturer can affect the rent it has to leave to each retailer.

5.2 Resale Price Maintenance

When manufacturers impose retail prices, in any symmetric equilibrium where both retailers carry both brands, the contract (w, p, F) must meet the following two constraints: $F \leq (p-w)D\,(p,p,p,p)$, otherwise retailers would obtain negative profits and a retailer would never accept both contracts; and

$$\begin{aligned}
&2\left((p-w)D\,(p,p,p,p)-F\right)\geq(p-w)D\,(p,\emptyset,p,p)-F\\
\Leftrightarrow\quad &F\leq(p-w)\,D\,(p,p,p,p)-(p-w)\left(D\,(p,\emptyset,p,p)-D\,(p,p,p,p)\right),
\end{aligned}$$

where $D\,(p_{ij},\emptyset,p_{hj},p_{hk})$ denotes the demand for brand i at retailer j when this retailer carries only that brand. Since removing a product increases the demand for the remaining ones, $D\,(p,\emptyset,p,p) > D\,(p,p,p,p)$, and retailers thus earn again a positive rent when the retailer margin $(p-w)$ is positive. The next proposition shows that such equilibria do exist and describe some of their properties:

[39] This would also be the case with general demands (also it requires some additional assumptions on the profit function π^r), whenever $\pi^r\,(v,w;v,w)-\pi^r\,(v,\emptyset;v,w)$ is increasing in v.

Proposition 5 *For any α, there exists a threshold $\overline{\beta}^{RPM}(\alpha) > 0$ such that, for any $\beta \leq \overline{\beta}^{RPM}(\alpha)$, there exists a continuum of symmetric equilibria with RPM and double common agency. More precisely, for any $\beta < \overline{\beta}^{RPM}(\alpha)$, there exist $\underline{p}(\alpha, \beta) \leq p^M$ and $\overline{p}(\alpha, \beta) \geq p^M$ (with at least one of the inequality being strict), such that for any $p^* \in \left[\underline{p}(\alpha, \beta), \overline{p}(\alpha, \beta)\right]$, there exists a symmetric equilibrium with RPM where, for any $i = A, B$ and any $j = 1, 2$, $p_{ij} = p^*$ and:*

- *$w_{ij} = w^*$, where w^* is inversely related to p^* and characterized by:*

$$p^* = \frac{1 - \alpha(1-\beta)w^*}{2(1-\alpha-\beta)};$$

- *retailers' profits are equal to $(p^* - w^*)\left[D(p^*, \emptyset, p^*, p^*) - D^*\right]$ and increase in p^* as long as $p^* \leq p^M$;*

- *manufacturers' profits are a decreasing function of p^*.*

Proof. See Appendix E. ■

Note that proposition 5 only provides sufficient conditions for the existence of symmetric equilibria with double common agency. There may exist other equilibria, including other symmetric double common agency equilibria. Figure 1 represents the range of values for which the results of propositions 4 and 5 apply.

Despite the presence of retail rents, the equilibrium retail price is still inversely related to the equilibrium wholesale price. When manufacturer h offers both retailers a wholesale price w_h and imposes a retail price p_h, manufacturer i's best response, $\widetilde{p}(p_h, w_h)$, is given by:

$$\begin{aligned}\widetilde{p}(p_h, w_h) = \arg\max_{p_i} \quad & \{(p_i - c - \gamma) D(p_i, p_h, p_i, p_h) + (p_h - w_h - \gamma) D(p_h, p_i, p_h, p_i) \\ & - (p_h - w_h - \gamma) D(p_h, \emptyset, p_h, p_i)\}\end{aligned}$$

Two effects are now at work. As in the absence of retail rents, manufacturer i has an incentive to increase the sales of its own products by being more aggressive, since it earns the full margin on these products and only internalizes (through the franchise fees) the retail margin on the sales of its rival's products. Moreover, this incentive to free-ride on the sales of the rival's products is greater, the lower the retail margin on those products. Therefore, in the absence of rents, an increase in the wholesale price w_h makes manufacturer i more aggressive.

However, the rent effect (the negative term on the second line of the above program) goes in the opposite direction. In order to reduce the rent left to retailer j, a manufacturer has an incentive to impose a low retail price on its rival, as this lowers the demand for

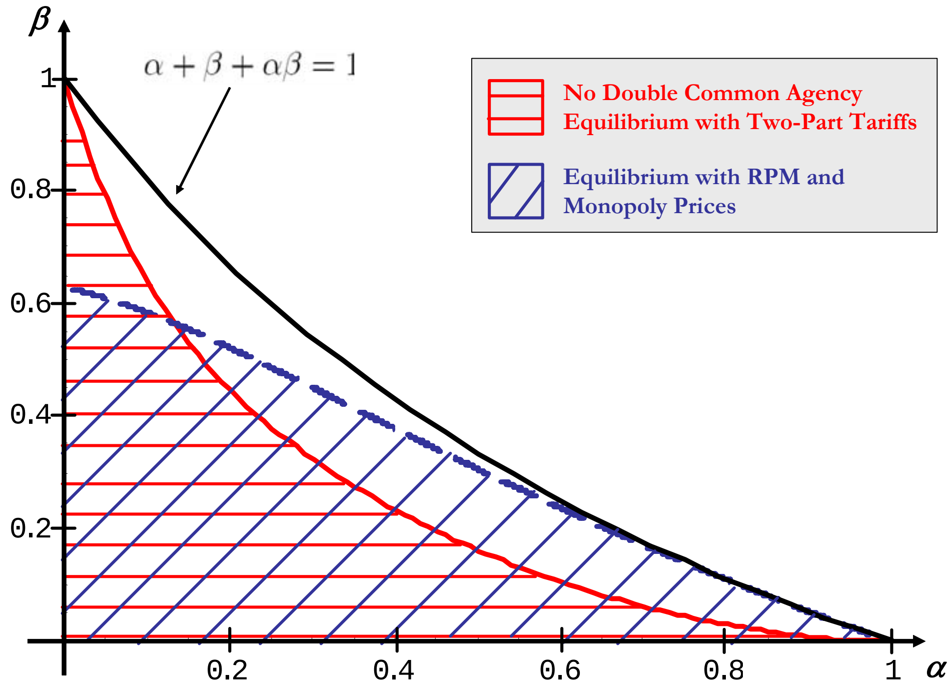

Figure 1: Existence of a double common agency equilibrium with monopoly prices

retailer j. However, an increase in w_h reduces, ceteris paribus, all retailers' rents; which in turn reduces the manufacturer incentives to behave aggressively. This effect would thus increase manufacturer h's reaction function to any price p_h. This second effect is however always dominated in the linear demand case; manufacturer h's reaction function, $\widetilde{p}(p_h, w_h)$, thus remains decreasing in w_h, as in the absence of rents, and the equilibrium retail p^* is again inversely related to the equilibrium wholesale price w^*.

This rent effect also affects the equilibrium wholesale price that is necessary to sustain monopoly retail prices. In the absence of rents, if manufacturer h sets its wholesale prices equal to marginal cost ($w_h = c$), manufacturer i's profit coincides (up to a constant, equal to the sum of its rival's franchise fees) with the industry profit. As a result, if manufacturer h sets its retail prices at the monopoly level, manufacturer i's best response is to set its own retail prices at the monopoly level too $\left(\widehat{p}\left(p^M, c\right) = p^M\right)$. This is no longer the case here, since manufacturer i has now additional incentives to lower its retail prices, in order to reduce the rent left to retailers. Therefore, its best response to p_h is lower than in the absence of rents: $\widetilde{p}(p_h, w_h) < \widehat{p}(p_h, w_h)$. This implies that, for wholesale prices equal to marginal cost $(w^* = c)$, the corresponding (symmetric) equilibrium retail price is lower than the monopoly price. In the linear demand case (with $c = \gamma = 0$), we have indeed:

$$p^*(0) = \frac{1}{2(1-\alpha-\beta)} < p^M.$$

However, since $\bar{p} \geq p^M$, there still exists some $w^M \in [\underline{w}, 0]$ such that $p^*\left(w^M\right) = p^M$: manufacturers can sustain monopoly prices, but to do so they must set wholesale prices below their marginal cost of production.

Subsidizing wholesale prices increases retail rents, however. In equilibrium, this rent (per retailer and per brand) is equal to:[40]

$$\pi_R^* = (p^* - w^*)\left[D\left(p^*, \emptyset, p^*, p^*\right) - D\left(p^*, p^*, p^*, p^*\right)\right] = \alpha(p^* - w^*)D^*.$$

Therefore,

$$\frac{1}{\alpha}\frac{d\pi_R^*}{dp^*} = \frac{d\left(p^* - w^*\right)}{dp^*}D^* + \left(p^* - w^*\right)\frac{dD^*}{dp^*}.$$

Given the inverse relationship between p^* and w^*, the mark-up $(p^* - w^*)$ increases with p^* and this effect dominates when p^* is small, since then $(p^* - w^*)$ is small and D^* is large.

Manufacturers' profits (per retailer) are of the form $\pi_P^* = p^* D^* - \pi_R^*$. Hence, starting from $p^* = \underline{p}$, manufacturers face a trade-off between increasing industry profits (by raising retail prices to the monopoly level) and reducing retail rents (by maintaining low retail prices). Proposition 5 shows that in this linear model, the rent effect dominates; therefore:

Corollary 1 *Among the equilibria with double common agency described in proposition 5, manufacturers prefer the equilibrium with the lowest retail price, whereas retailers prefer the equilibrium with the highest retail price, which exceeds the monopoly level.*

6 Policy Discussion

This paper highlights how RPM can eliminate any scope for effective competition when producers distribute their goods through the same competing retailers ("interlocking relationships"). The intuition is relatively simple. As in the single common agent case, distributing their products through the same retailers allow the manufacturers to eliminate, or at least soften, interbrand competition. However, when dealing with several (common) retailers, intrabrand competition dissipates profits and prevents manufacturers from maintaining monopoly prices. In this context, RPM can restore monopoly prices and profits. In essence, RPM eliminates competition between retailers, while "common agency" eliminates competition between manufacturers. Since the mechanism identified by our analysis cannot be replicated through other vertical restraints (e.g., exclusive dealing or exclusive territories), this paper offers one of the few arguments to justify the negative attitude of the courts towards price restrictions.

[40] By definition, $D\left(p^*, \emptyset, p^*, p^*\right) = D\left(p^*, \overline{p}, p^*, p^*\right)$, where $\overline{p} = 1 + (\alpha + \beta + \alpha\beta)\, p^*$. We thus have: $D\left(p^*, \emptyset, p^*, p^*\right) = 1 - p^* + \alpha\overline{p} + \beta p^* + \alpha\beta p^* = (1 + \alpha)\, D\left(p^*, p^*, p^*, p^*\right)$.

Our analysis thus supports the concerns of the French Conseil de la Concurrence when, as mentioned in the introduction, it condemned (in three separate cases) brown goods, perfume and toy manufacturers for engaging, through RPM, into "vertical collusion" with leading multi-brand retailers. It also supports the ongoing efforts to reform the French law, adopted in 1996, that allowed manufacturers to impose de facto price floors by abusing no-resale-below-cost regulations, and which has been blamed for the important price increases that have taken place in the last decade, especially for national brands in supermarket chains. Our analysis supports this claim and shows that RPM can actually eliminate competition, not only among competing fascias, but also among competing brands. This possibility has been validated by recent empirical studies. Using data about retail prices of food products in French retail chains during the period 1994-1999, Biscourp, Boutin and Vergé (2008) find that the correlation between retail prices and the concentration of local retail markets was important before 1997 and no longer significant after that date. This suggests that the price increases that occurred after 1997 were indeed due to the impact of the new legislation on intrabrand competition.

Our analysis also shows that double agency equilibria may fail to exist in the presence of real retail bottlenecks, while there can be a continuum of equilibrium retail prices with RPM (including at the monopoly level). The existence of equilibria of given types (common multi-brand retailers versus mono-brand retailers, for example), as well as the choice of a particular equilibrium, constitute interesting questions, which recent empirical analyses have started to address: Bonnet and Dubois (2004 and 2007), for instance, study the French market of bottled water during the 1998-2001 period, using a structural econometric model based on micro-level data. They build on Berto Villas-Boas (2007), who extends the empirical approach developed by Berry, Levinsohn and Pakes (1995) to multiple stages of competition (upstream competition among manufacturers and downstream competition among retailers), to compare different scenarii: linear or two-part tariffs for wholesale prices, RPM or not for retail prices, etc. In particular, Bonnet and Dubois (2004) carry a structural estimation of a model directly inspired by the analysis presented in our section 4. Comparing different types of vertical contracts, they conclude that the most likely scenario is the one with two-part tariffs, RPM and no retail margin.[41] Their finding thus supports the interpretation of the 1996 law as legalizing RPM, as well as our analysis of its impact on prices and profits. When simulating the impact of an effective ban on RPM, they find that retail prices would decrease by about 7% on average. Bonnet and Dubois (2007) extends the analysis to allow for endogenous retail rents (as in our section 5) and conclude again that two-part tariffs and resale price maintenance are widely used, but also that the most likely scenario is one where retailers' outside options

[41] Berto Villas-Boas (2007) studies the distribution of yoghurts by supermarkets in California and also finds that non-linear prices are widely used. However, she does not test for the presence of RPM.

are fixed (thus closer to the variant we study in section 4).

Our analysis thus suggests a cautious attitude towards price restrictions in situations where rival manufacturers rely on the same competing retailers, even – and possibly more so – in the absence of retail bottlenecks.

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A Proof of Proposition 1

We first show that equilibrium upstream margins are positive ($w^e > c$). The conclusion then follows from the fact that manufacturers fail to account for (and thus "free-ride" on) their rivals' upstream margins. At a symmetric equilibrium of the form ($p_{ij} = p^e, w_{ij} = w^e$), manufacturer i must find it optimal to choose $w_{i1} = w_{i2} = w^e$ when its rival adopts $w_{h1} = w_{h2} = w^e$; $w = w^e$ must therefore maximize:

$$2\left[(\widetilde{p}(w, w^e) - c - \gamma)\widetilde{D}(w, w^e) + (\widetilde{p}(w^e, w) - w^e - \gamma)\widetilde{D}(w^e, w)\right].$$

The first-order condition yields (with D evaluated at p^e and the derivatives of $\widetilde{D}$ and $\widetilde{p}$ evaluated at (w^e, w^e)) : $(\partial_1\widetilde{p} + \partial_2\widetilde{p})\,D + (p^e - c - \gamma)\,\partial_1\widetilde{D} + (p^e - w^e - \gamma)\,\partial_2\widetilde{D} = 0$, implying:

$$(\partial_1\widetilde{p} + \partial_2\widetilde{p})\,D + \left(\partial_1\widetilde{D} + \partial_2\widetilde{D}\right)(p^e - w^e - \gamma) = -\,(w^e - c)\,\partial_1\widetilde{D}. \tag{4}$$

Note that $\partial_1\widetilde{D} = \lambda_M\partial_1\widetilde{p} + \hat{\lambda}_M\partial_2\widetilde{p}$ and $\partial_2\widetilde{D} = \lambda_M\partial_2\widetilde{p} + \hat{\lambda}_M\partial_1\widetilde{p}$, where $\lambda_M \equiv \partial_1 D + \partial_3 D$ represents the marginal impact on the demand for "product" $i - j$ of a uniform increase in the retail prices for brand i, while $\hat{\lambda}_M \equiv \partial_2 D + \partial_4 D$ represents instead the impact of the rival manufacturer's retail prices. Therefore, (4) can be rewritten as:

$$(\partial_1\widetilde{p} + \partial_2\widetilde{p})\left[D + \lambda\,(p^e - w^e - \gamma)\right] = -\,(w^e - c)\,\partial_1\widetilde{D}, \tag{5}$$

where $\lambda \equiv \lambda_M + \hat{\lambda}_M$ represents the impact on demand of a uniform increase in all retail prices and is thus negative. But a symmetric retail equilibrium is characterized by the first-order condition:

$$D = -\lambda_R\,(p^e - w^e - \gamma)\,, \tag{6}$$

where $\lambda_R \equiv \partial_1 D + \partial_2 D$ represents the impact on the demand for "product" ij of a uniform increase in retailer j's prices. Combining (5) and (6) yields:

$$(\partial_1\widetilde{p} + \partial_2\widetilde{p})\,\hat{\lambda}_R\,(p^e - w - \gamma) = -\,(w^e - c)\,\partial_1\widetilde{D}, \tag{7}$$

where $\hat{\lambda}_R \equiv \partial_3 D + \partial_4 D = \lambda - \lambda_D$ represents the marginal impact on demand of a simultaneous increase in the rival retailer's prices and is thus positive. Note that $\lambda_R < 0$ (since $\lambda < 0 < \hat{\lambda}_R$), and thus (6) implies $p^e \geq w^e + \gamma$. But then, since $\partial_1\widetilde{p} + \partial_2\widetilde{p} > 0$ and $\partial_1\widetilde{D} < 0$ from Assumption 1, (7) implies $w^e > c$.

The first-order condition (4) can now be rewritten as:

$$(\partial_1\widetilde{p} + \partial_2\widetilde{p})\,D + \left(\partial_1\widetilde{D} + \partial_2\widetilde{D}\right)(p^e - c - \gamma) = (w^e - c)\,\partial_2\widetilde{D}.$$

Given that $\partial_1\widetilde{D} + \partial_2\widetilde{D} = \lambda\,(\partial_1\widetilde{p} + \partial_2\widetilde{p})$ and $\partial_1\widetilde{p} + \partial_2\widetilde{p} > 0$, having $w^e > c$ implies that $D + \lambda\,(p^e - c - \gamma) > 0$. This in turn implies that, starting from $p = p^e$, a uniform increase in all prices increases the monopoly profit. By assumption the monopoly profit is single-peaked at p^M and thus, $p^e < p^M$. ■

B Proof of Proposition 2

If manufacturer h adopts $w_{h1} = w_{h2} = w^*$ and $p_{h1} = p_{h2} = p^*$, from Assumption 2, manufacturer i's revenue function Π is single-peaked in (p_{i1}, p_{i2}) and maximal for symmetric prices, $\hat{p}_{i1} = \hat{p}_{i2} = \hat{p}(p^*, w^*)$; this price maximizes $\Pi(p, p^*, p, p^*, w^*, w^*)$ and thus solves:

$$\hat{p}(p^*, w^*) = \arg\max_p f(p, p^*, w^*) \equiv (p - c - \gamma) D(p, p^*, p, p^*) + (p^* - w^* - \gamma) D(p^*, p, p^*, p).$$

Obviously, $p^M = \hat{p}\left(p^M, c\right)$; thus $\left(w^* = c, p^* = p^M\right)$ always constitutes an equilibrium. In addition, for any wholesale price w^* there exists a price p^* satisfying $p^* = \hat{p}(p^*, w^*)$; this price is characterized by the first-order equation:

$$D + \lambda_M (p^* - c - \gamma) + \hat{\lambda}_M (p^* - w^* - \gamma) = 0,$$

with λ_M and $\hat{\lambda}_M$ as defined in the previous section. To establish that p^* decreases when w^* increases, note first that $\partial^2_{13} f = -\hat{\lambda}_M < 0$. Therefore, a standard revealed preference argument leads to $\partial_2 \hat{p} < 0$. From Assumption 2, $0 < \partial_1 \hat{p} < 1$, implying that the fixed point of $p \rightarrow \hat{p}(p, w^*)$ decreases when w^* increases. ■

C Proof of Proposition 3

The proof is constructive and based on the following candidate equilibrium path: both manufacturers offer the contract $C^c = \left(w^c = c, p^c = p^M, F^c = \left(p^M - c - \gamma\right) D\left(\mathbf{p}^M\right)\right)$ to the "established" retailers 1 and 2 and all four offers are accepted at stage $1-A$. Retailers thus make zero profits and manufacturers share the monopoly profit.

No profitable deviation for the retailers

Since rejecting both offers yields zero profit for a retailer, the only deviation to consider is one in which retailer j $(j = 1, 2)$ rejects one offer (say, manufacturer i's offer) while accepting the second one. In this case, because $w^c = c$, manufacturer i always finds it profitable to deal with the alternative retailer j_i, and, under Assumption 4 sets a retail price, $p^{**} = \arg\max_p (p - c - \gamma) D\left(p, p^M, p^M, p^M\right) < p^M$. Retailer j then sells a quantity of product $h - j$ lower than $D\left(\mathbf{p}^M\right)$ and thus achieves a negative profit.

No profitable deviation for the manufacturers

A deviation by manufacturer i at stage $1 - A$ may affect the set of contracts that are accepted at this stage. We therefore evaluate the profitability of such a deviation for all possible market structures. Remember that if all offers C^c are accepted, manufacturer i gets $\frac{\pi^M}{2}$. The deviations fall into three categories:

Manufacturer h's offers have both been accepted

We can easily rule out any such deviation since both retailers j and k would then have accepted to pay $F^c = \frac{\pi^M}{4}$ each to the manufacturer h. Since the industry profit cannot exceed π^M, and a retailer would never accept an offer that generates losses, manufacturer i will never be able to achieve more than $\pi^M - 2F^c = \frac{\pi^M}{2}$.

Manufacturer h's offers have both been rejected

At stage $1 - B$, manufacturer h thus deals with the alternative retailers (1_h and 2_h) and chooses the prices, p_{h1} and p_{h2}, that are its best replies to the prices p_{i1} and p_{i2} that have either been accepted by the retailer(s) at stage $1 - A$, or that are set by manufacturer i (dealing with retailers 1_i and 2_i) at stage $1 - B$. The prices p_{h1} and p_{h2} are therefore equal to the prices set by the follower of our first Stackelberg scenario when the leader sets prices p_{i1} and p_{i2}.[42] Given that manufacturer i's profit can only come from the sales of products $i - 1$ and $i - 2$ (through either the "established" or the "alternative" retailers), its profit cannot exceed that of the leader of this first Stackelberg scenario which, by Assumption 3, is lower than $\frac{\pi^M}{2}$.

Only one of manufacturer h's offers has been accepted (say, by retailer j)

At stage $1 - B$, manufacturer h thus sells product $h - k$ through the "alternative" retailer k_h. Given that $w_{hj} = c$, it chooses the price p_{hk} that maximizes the profit made on the sales of this product. This price is thus the follower's best response in our second Stackelberg scenario where the leader sets prices p_{i1}, p_{i2} and $p_{h1} = p^M$.[43]

We now have two possibilities to consider depending on whether the deviation is such that retailer j accepts manufacturer i's offer or not.

- Suppose first that the deviation is such that the offer $i - j$ is accepted. In this case, manufacturer i can recover, through the franchise F_{ij}, the retail profit made by retailer j on product $h - j$ minus the franchise $F^C = \frac{\pi^M}{4}$ that retailer j has to pay to manufacturer h. Given that $w_{hj} = c$, the retail margin is equal to the total margin, and manufacturer i thus sets prices p_{i1} and p_{i2} (simultaneously or not), taking into account the total margin (wholesale plus retail) on products $i - 1$ and $i - 2$, but also on product $h - j$. Remember however that manufacturer i cannot set the price of this last product (this price is necessarily $p_{hj} = p^M$) and that a share equal to $\frac{\pi^M}{4}$ of the profit made on product $h - j$ has to be paid to manufacturer h. Therefore, manufacturer i's profit cannot

[42] In this scenario, the leader (respectively, the follower) produces and sells at cost $c + \gamma$ the "products" $A1$ and $A2$ (respectively, $B1$ and $B2$).

[43] In this scenario, the leader produces and sells at cost $c + \gamma$ the "products" $A1$, $A2$ and $B1$, while the follower produces and sells at cost $c + \gamma$ the "products" $B2$.

exceed that of the leader of the second Stackelberg scenario minus $\frac{\pi^M}{4}$. Under Assumption 3, this profit is lower than $\frac{3\pi^M}{4} - \frac{\pi^M}{4} = \frac{\pi^M}{2}$.

- Suppose finally that the deviation is such that the offer $i - j$ is rejected. For such a situation to arise at the end of stage $1 - A$, the contracts must be such that retailer j expects its retail profit (on product $h - j$) to cover the franchise to be paid to manufacturer h. This means that the profit generated by product $h - j$ has to be larger than $\frac{\pi^M}{4}$. However, if this is the case, manufacturer i would rather make an offer to retailer j (rather than distributing the product through the alternative retailer j_i) to recover all the profit generated above$\frac{\pi^M}{4}$ on product $h - j$. ■

D Proof of Proposition 4

We now focus here on values of the parameters α and β for which:

$$\pi^r (w, w; w, w) - \pi^r (w, \emptyset; w, w) < \pi^r (w, w; \emptyset, w) - \pi^r (w, \emptyset; \emptyset, w) . \tag{8}$$

In the linear demand case, it can be shown that the condition (8) does not depend on w, and simply rewrites as $\beta < \overline{\beta} (\alpha)$, where $\overline{\beta} (\alpha) > 0$ is uniquely defined. We assume, in what follows, that $\beta \leq \overline{\beta} (\alpha)$, i.e. the gain from accepting both offers rather manufacturer A's offer only is larger when the rival retailer has accepted manufacturer B's offer only than when it has accepted both offers.

In the linear demand, it can be shown, that this gain is also larger than when the rival retailer has rejected both offers, i.e., whenever $\beta < \overline{\beta} (\alpha)$, we have:

$$\pi^r (w, w; w, w) - \pi^r (w, \emptyset; w, w) < \pi^r (w, w; \emptyset, \emptyset) - \pi^r (w, \emptyset; \emptyset, \emptyset) .$$

In lemma 1, we had already shown that, for double common agency to be an equilibrium, it suffices to check that each retailer preferred to accept both offers rather than one, when its rival accepts both offers. The only relevant constraint is then:

$$F \leq \pi^r (w, w; w, w) - \pi^r (w, \emptyset; w, w) . \tag{9}$$

All of this implies that whenever (9) is satisfied, the unique continuation equilibrium is one where the two retailers decide to carry both brands. If (9) were not binding, it would then be profitable for a manufacturer to slightly increase its franchise fees, since this would affect neither the equilibrium market structure, nor the equilibrium prices and quantities. As a result, in any (symmetric) double common agency equilibrium, we have: $F = \pi^r (w, w; w, w) - \pi^r (w, \emptyset; w, w)$.

To show that no symmetric, double common agency equilibrium exists, we now build, for any admissible value of w, a profitable deviation for one of the manufacturers.[44] We

[44] A value of w is admissible, whenever the corresponding retail price and quantities are positive.

first concentrate on $w > 0$, and consider a deviation where manufacturer A offers the contract (v, G) such that $v = w - \varepsilon$ and $G = \pi^r(v, \emptyset; v, w) - \pi^r(\emptyset, w; v, w) + F - \eta$,with $\varepsilon, \eta > 0$. Note that, when ε and η tend to 0, (v, G) tends to (w, F). Therefore, for ε and η small enough, it is still a best reply for a retailer to accept both contracts whenever the rival retailer has rejected at least one contract. Suppose now that retailer k has accepted both offers. Since ε and η are small, it cannot be a best response to reject both offers. As we now show, it is a best response to accept only manufacturer A's offer:

$$\pi^r(v, \emptyset; v, w) - G = \pi^r(\emptyset, w; v, w) - F + \eta > \pi^r(\emptyset, w; v, w) - F.$$

Moreover,

$$\begin{aligned} & \pi^r(v, \emptyset; v, w) - G > \pi^r(v, w; v, w) - G - F \\ \Leftrightarrow \quad & \pi^r(w, w; w, w) - \pi^r(w, \emptyset; w, w) > \pi^r(v, w; v, w) - \pi^r(v, \emptyset; v, w) \,, \end{aligned}$$

condition which is always satisfied in the linear demand case whenever $v < w$. Such a deviation thus allows manufacturer A to partially exclude its rival; it also increases the sales of its products, without (substantially) affecting the franchise fees it receives. The deviation is thus profitable as long as the wholesale margin is strictly positive $(w > 0)$.

Suppose now that $w \leq c$, and consider a (symmetric) deviation by manufacturer A that consists of offering the contract (v, G), with $v = w + \varepsilon$ and

$$G = \pi^r(v, w; v, w) - \pi^r(\emptyset, w; v, w) - \eta,$$

with $\varepsilon, \eta > 0$ close to 0. In the linear case, it is possible to check that double common agency is the unique continuation equilibrium, and that the deviation, which yields the following profit to manufacturer A :

$$\Pi_A^{dev}(v; w) = 2vD_{ij}^r(v, w, v, w) + \pi^r(v, w; v, w) - \pi^r(\emptyset, w; v, w) - 2\eta,$$

is indeed profitable for some $\varepsilon, \eta > 0$ close to 0. This thus concludes the proof that no "double common agency equilibrium" exists when $\beta < \overline{\beta}(\alpha)$. ■

E Proof of Proposition 5

We look for sufficient conditions on w^* to ensure that $C^* = (w^*, p^*, F^*)$, where

$$p^* = \frac{1 - \alpha(1 - \beta)w^*}{2(1 - \alpha - \beta)} \text{ and } F^* = (1 - \alpha)(p^* - w^*)D(\mathbf{p}^*)\,,$$

is the equilibrium wholesale contract of a symmetric double common agency equilibrium. We only sketch the proof here; a more detailed proof is available upon request. Note that we have constrained the retail price p^* to be higher than the marginal wholesale price w^*, therefore imposing $w^* \leq w^{\max} = \frac{1}{2-\alpha-2\beta-\alpha\beta}$. Moreover, quantities must be positive, thereby constraining w^* to be such that:

$$q^* = D\left(\mathbf{p}^*\right) \geq 0 \Leftrightarrow w^* \geq w^{\min} = -\frac{1-\alpha}{\alpha(1-\alpha-\beta-\alpha\beta)}.$$

In what follows, we only provide sufficient conditions that guarantee that no deviation by a manufacturer can be profitable. Depending on the contracts C_{i1} and C_{i2} offered by manufacturer i, the set of contracts accepted by the retailers differs, and we should therefore analyze the effects of a deviation on manufacturer i's profits for any possible market structure. There are 16 such structures, but symmetry reduces this number to 10. Moreover it cannot be profitable for a manufacturer to deviate in such a way that its contracts would both be rejected, leaving only 7 structures to analyze.

Structure 0 : Double common agency

In order to obtain a continuation equilibrium where both retailers carry both brands, manufacturer i has to propose contracts C_{i1} and C_{i2} such that, for $j \neq k \in \{1, 2\}$:

$$(p_{ij} - w_{ij})D\left(p_{i1}, p^*, p_{ik}, p^*\right) - F_{ij} + (p^* - w^*)D\left(p^*, p_{ij}, p^*, p_{ik}\right) - F^* \geq ...$$

$$\begin{aligned} ... &\geq 0 && (10)\\ ... &\geq (p^* - w^*)D\left(p^*, \emptyset, p^*, p_{ik}\right) - F^* && (11)\\ ... &\geq (p_{ij} - w_{ij})D\left(p_{ij}, \emptyset, p_{ik}, p^*\right) - F_{ij} && (12)\end{aligned}$$

Constraint (11) implies that maximal fixed fee that manufacturer i can obtain from retailer j is:

$$F_{ij} = (p_{ij} - w_{ij})D\left(p_{ij}, p^*, p_{ik}, p^*\right) + (p^* - w^*)\left(D\left(p^*, p_{ij}, p^*, p_{ik}\right) - D\left(p^*, \emptyset, p^*, p_{ik}\right)\right).$$

Its maximal profit is therefore:

$$\pi_i(p_{ij}, p_{ik}) = \sum_{j \neq k = 1,2} \left(p_{ij} D\left(p_{ij}, p^*, p_{ik}, p^*\right) + (p^* - w^*)\left(D\left(p^*, p_{ij}, p^*, p_{ik}\right) - D\left(p^*, \emptyset, p^*, p_{ik}\right)\right)\right).$$

This profit is maximized for $p_{ij} = p_{ik} = p^*$, so that a deviation to "double common agency" cannot be profitable.

Structure 1 : $(ij - ik - hj)$, contract C_{hk} is rejected.

In order to ensure that this structure can be a continuation equilibrium, contracts C_{ij} and C_{ik} must satisfy the following constraints:

$$(p_{ij} - w_{ij})\, D(p_{ij}, p^*, p_{ik}, \emptyset) - F_{ij} + (p^* - w^*)D(p^*, p_{ij}, \emptyset, p_{ik}) - F^* \geq ...$$

$$\begin{aligned} ... &\geq 0 & (13)\\ ... &\geq (p^* - w^*)D(p^*, \emptyset, \emptyset, p_{ik}) - F^* & (14)\\ ... &\geq (p_{ij} - w_{ij})\, D(p_{ij}, \emptyset, p_{ik}, \emptyset) - F_{ij} & (15) \end{aligned}$$

and

$$(p_{ik} - w_{ik})\, D(p_{ik}, \emptyset, p_{ij}, p^*) - F_{ik} \geq ...$$

$$\begin{aligned} ... &\geq 0 & (16)\\ ... &\geq (p^* - w^*)D(p^*, \emptyset, p^*, p_{ij}) - F^* & (17)\\ ... &\geq (p_{ik} - w_{ik})\, D(p_{ik}, p^*, p_{ij}, p^*) - F_{ik} + (p^* - w^*)D(p^*, p_{ik}, p^*, p_{ij}) - F^* & (18) \end{aligned}$$

Wholesale prices w_{ij} and w_{ik} can be set so that constraints (15) and (18) are satisfied. If manufacturer i sets the maximal possible fixed fees, its profit is:

$$\begin{aligned} \pi_{S1}(p_{ij}, p_{ik}) &= p_{ij}D(p_{ij}, p^*, p_{ik}, \emptyset) - \max\left[0, (p^* - w^*)\left(D(p^*, \emptyset, \emptyset, p_{ik}) - (1-\alpha)q^*\right)\right] \\ &\quad + p_{ik}D(p_{ik}, \emptyset, p_{ij}, p^*) - \max\left[0, (p^* - w^*)\left(D(p^*, \emptyset, p^*, p_{ij}) - (1-\alpha)q^*\right)\right] \\ &\quad + (p^* - w^*)\left[D(p^*, p_{ij}, \emptyset, p_{ik}) - (1-\alpha)q^*\right] \end{aligned}$$

It is now sufficient to compare the maximal value of this profit with $\pi_P^*(w^*)$, that is, consider the sign of the expression: $\Delta_1(w^*) = \max_{p_{ij}, p_{ik}} \pi_{S1}(p_{ij}, p_{ik}) - \pi_P^*(w^*)$. With linear demands, we can show that there exist a non-trivial interval $[\underline{w}_1(\alpha, \beta), \overline{w}_1(\alpha, \beta)]$ within which such a deviation is never profitable, i.e.: $\Delta_1(w^*) \leq 0$.

Remaining Structures

Repeating the analysis for each of the five remaining structures generates additional restrictions, $w^{\min} \leq \underline{w}_i(\alpha, \beta) \leq w^* \leq \overline{w}_i(\alpha, \beta) \leq w^{\max}$, for any $i = 2, ..., 6$. Let us now define:

$$\underline{w}(\alpha, \beta) = \max\left[w^M, \max_{i=1,...,6} \underline{w}_i(\alpha, \beta)\right] \text{ and } \overline{w}(\alpha, \beta) = \min_{i=1,...,6} \overline{w}_i(\alpha, \beta).$$

We then verify that, for the values of the parameters α and β given by figure 1, i.e. whenever $\beta \leq \overline{\beta}^{RPM}(\alpha)$, we have $\underline{w}(\alpha, \beta) = w^M \leq \overline{w}(\alpha, \beta) \Leftrightarrow \underline{p}(\alpha, \beta) \leq p^M \leq \overline{p}(\alpha, \beta)$. ■