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Jeanine Miklos-Thal, *University of Rochester*
Patrick Rey, *Toulouse School of Economics*
Thibaud Verge

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Vertical relations

Jeanine Miklós-Thal [a], Patrick Rey [b,*], Thibaud Vergé [c]

[a] William E. Simon Graduate School of Business Administration, University of Rochester, United States
[b] Toulouse School of Economics (GREMAQ, IDEI and Institut Universitaire de France), France
[c] CREST-LEI, Paris, France

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ABSTRACT

The paper presents recent advances in the analysis of successive oligopolies characterized by "interlocking relationships", where competing upstream suppliers deal with the same set of competing downstream partners. We first highlight the extent to which interlocking relationships alter competition, and may allow vertical restraints such as Resale Price Maintenance to eliminate it upstream as well as downstream. Modeling difficulties, such as the inexistence or a large multiplicity of equilibria, however arise. After reviewing how similar issues have been successfully addressed in the case of a single supplier, we draw lessons for more general multilateral settings.

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1. Introduction

In many industries rival suppliers deal with the same set of competing downstream partners in order to serve their customers' needs. French consumers, for example, can buy *Coke* as well as *Pepsi* at both *Carrefour* and *Auchan* supermarkets. Many computer manufacturers develop product lines using either *AMD* or *Intel* chips.

The formal modeling of such "interlocking" vertical relations has proved difficult, however, and we still know relatively little about many basic questions. Who is likely to deal with whom (that is, which channels will be active)? Will firms engage in exclusionary practices, or will they try to achieve a cozier outcome and sustain high retail prices despite upstream and downstream rivalry? Recent advances show that answers depend critically not only on the nature of competition (prices, quantities, ...) but also on the types of negotiations (simultaneous or sequential, with or without renegotiation, public or private, ...) and contracts (linear, non-linear, vertical restraints, ...).[1]

Section 2 emphasizes the impact of interlocking relationships on competition in successive oligopolies, and shows how vertical restraints such as Resale Price Maintenance (RPM) can eliminate interbrand as well as intrabrand competition. It also stresses that interlocking relationships cause modeling issues such as either the inexistence or a large multiplicity of equilibria even in simple competition games. Section 3 reviews recent analyses of simpler industry structures, with only one firm either at the upstream or at the downstream level, which help us to draw lessons for more general multilateral market situations (Section 4).

2. Multilateral contracting: a first look

In this section, we consider a very simple case of interlocking relationships between manufacturers and retailers. Two manufacturers, M_A and M_B, each producing its own brand, can distribute their goods at two retail locations, R_1 and R_2. There are thus four possible combinations or channels of the form $M_i - R_j$ ($i = A, B$ and $j = 1, 2$). Goods and locations are differentiated, so there is potential for imperfect competition upstream as well as downstream. We assume that demand for the four channels is symmetric[2]; efficiency thus requires all four of them being active. Production and distribution unit costs are constant and symmetric, so that industry profits are maximized when all retail prices are set at the same monopoly level, denoted by p^M.

* Corresponding author.
E-mail address: prey@cict.fr (P. Rey).

[1] Another issue, which will be ignored here, concerns the role of vertical integration. Salinger (1988) and Ordover et al. (1990) were the first to show that integration can lead to input foreclosure, provided the integrated firm withdraws from the intermediate market and wholesale contracts are inefficient (linear wholesale prices, generating double marginalization problems). Recently, Allain et al. (2009) show that integration generates similar incentives to limit rivals' access to input and customers in situations where vertical exchanges of sensitive information are key for innovation, and results in foreclosure even when integrated firms keep competing on the intermediate market and contracts are bilaterally efficient.

[2] Some regularity conditions are also assumed, which are for example satisfied when retail prices are strategic complements and direct effects dominate indirect ones.

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Rey and Vergé (forthcoming) – hereafter RV – study a simple competition game in this context: manufacturers offer (public) contracts to retailers, which retailers accept or reject before competing in prices. To avoid double marginalization issues and achieve bilateral efficiency, each M_i can offer each R_j a two-part tariff, stipulating a franchise fee F_{ij} and a wholesale price w_{ij}. To study the role of vertical restraints, they also consider RPM, which amounts to allowing M_i to specify the price p_{ij} at which R_j should sell its product.

2.1. No retail bottleneck

RV first analyze a situation without retail bottlenecks, in which there exists a competitive supply of potential retailers for each retail location.[3] Both brands are then always present at both retail locations, and the key question is how well firms can coordinate their pricing decisions. Propositions 1 and 2 in RV show that:

Proposition 1. In the absence of a retail bottleneck:

- Without RPM, retail prices lie below the monopoly level ($p<p^M$) in any symmetric equilibrium.
- If RPM is allowed then there always exists an equilibrium in which wholesale prices are at cost and retail prices at the monopoly level. Under mild regularity conditions,[4] there moreover exists a continuum of symmetric equilibria, in which lower wholesale prices imply higher retail prices.

Without RPM, upstream competition in two-part tariffs followed by downstream competition in retail prices results in a somewhat competitive outcome. The reason behind this result is intricate since, in the absence of bottlenecks, manufacturers can extract all profits. In particular, a manufacturer can recover any increase in the retailers' variable profits through its franchise fees; it thus internalizes the impact of its pricing decisions not only on the whole profit generated by its own brand, but also on the retail profits realized on the rival brand. Manufacturers are therefore willing to keep retail prices up and can indeed do so by setting wholesale prices sufficiently above cost. But this, in turn, gives each retailer an incentive to undercut its rival in order to free-ride on its wholesale margin. As a result, equilibrium retail prices remain below the monopoly level.

A second insight is that RPM provides an effective coordination device, as it allows manufacturers to maintain high retail prices even if upstream mark-ups are low. Adopting wholesale prices equal to costs (and using franchise fees to recover retail profits) then eliminates the incentives to free-ride on each other's wholesale margins and yields the monopoly outcome: each manufacturer, facing rival retail prices at p^M and dealing with retailers who earn the full margin on the rival brand, has an incentive to set its own retail prices at p^M as well. The multiplicity of equilibria stems from the fact that the joint profits of M_i and R_j do not depend on the wholesale price w_{ij} anymore, since retail prices are no longer driven by wholesale prices but directly set by manufacturers. M_i and R_j can therefore agree on any w_{ij} (and adjust the fixed fee F_{ij} so as to share profits as desired). The choice of wholesale price affects the behavior of M_i and R_j vis-à-vis their rivals, however; as a result, different profiles of wholesale prices sustain different equilibria.

2.2. Retail bottlenecks

Suppose now that a single retailer is available at each retail location, so that a brand cannot be sold in a location without the local retailer's consent. Control over a bottleneck creates a rent: by refusing to carry a brand, a retailer could foster the sales of the rival brand, on which downstream differentiation guarantees a positive margin. Therefore, each retailer's profit must be positive whenever it carries both brands.

Another implication of retail bottlenecks is that a brand may no longer be sold at both locations. Indeed, in any equilibrium in which all channels are active, both retailers must be indifferent between carrying both brands or only (either) one, since a manufacturer could otherwise ask for better terms. This implies that even small deviations by a manufacturer may trigger a different market structure. Since there are 16 potential market structures, many possible deviations must be considered and it is difficult to ensure that none of them is profitable.

RV confirm this concern by means of a linear demand example, of the form[5] $D_{ij}(p)=1-p_{ij}+\alpha p_{-ij}+\beta p_{i-j}+\alpha\beta p_{-i-j}$, where α, $\beta\geq 0$ must satisfy $\alpha+\beta+\alpha\beta<1$ to ensure that demand decreases when all prices increase. They also confirm with that example the effectiveness of RPM as a coordination device (see RV, Propositions 4 and 5):

Proposition 2. For a large range of parameters (area with horizontal lines in Fig. 1), competition in two-part tariffs cannot result in all channels being active. On the contrary, with RPM there often exists a continuum of equilibria, including one sustaining the monopoly outcome (area with diagonal lines in Fig. 1).

2.3. Lessons

This analysis helps us to gain a better understanding of competition in the presence of interlocking relationships. Moreover, it suggests that a price restraint such as RPM is effective in eliminating interbrand as well as intrabrand rivalry. The latter insight has been empirically validated by Biscourp et al. (2008) and Bonnet and Dubois (2007, 2010) using French data over a period where the so-called Galland Act *de facto* allowed manufacturers to implement RPM clauses.[6]

This first look also shows that serious modeling problems arise in the presence of retail bottlenecks. First, the non-existence, for a large range of parameters, of any equilibrium in which all channels are active – although each channel is a source of added value – puts into question the plausibility of the analysis and the robustness of the findings. It also limits the scope for welfare analysis by making it impossible to compare prices with and without RPM. Second, to establish equilibrium existence (as done in the RPM case) one needs to rule out deviations to many different potential market structures, which limits the tractability of the approach — and seems hard to replicate without adopting particular cost and demand specifications.

While in RV manufacturers have all the bargaining power (that is, they make take-it-or-leave-it offers to retailers), similar issues arise when retailers have the bargaining power. If all channels were active in equilibrium, the manufacturers would have to be indifferent between accepting both or only one of the retailers' offers, which would again generate many types of potential deviations.

At least two alternative approaches circumvent these difficulties. First, restricting attention to linear wholesale tariffs, as in Dobson and Waterson (2007), contributes to ensure that each retailer strictly prefers to carry both brands, which simplifies the analysis and restores the existence of an equilibrium with all channels active, even

[3] The same analysis would apply if manufacturers could alternatively set-up their own outlets and sell directly to consumers.

[4] Namely, for any symmetric wholesale prices there exists a unique, stable, retail equilibrium, which moreover preserves symmetry. These conditions are for example satisfied in the linear case studied below.

[5] In what follows, "$-i$" and "$-j$" respectively refer to M_i's and R_j's rivals.

[6] Biscourp et al. show that the positive correlation between market concentration and retail prices disappears following the adoption of the Galland Act, suggesting that competition forces are no longer at work. Bonnet and Dubois estimate several variants of a successive oligopoly model, using a structural econometric approach and panel data on the French market for bottled water. They find that the best fit involves two-part tariffs and RPM and that a ban on RPM would result in a significant price reduction.

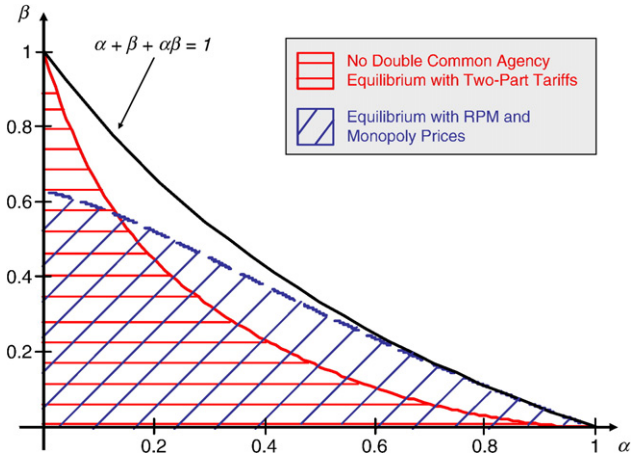

Fig. 1. Existence of equilibria in which all channels are active.

in the absence of any additional vertical restraint.[7] It however supposes that firms adopt bilaterally inefficient contracts. Another approach, adopted for example by Inderst and Wey (2003, 2007), relies on independent pairwise negotiations; one interpretation is that firms use different agents in order to deal with different partners. This approach offers more tractability (by eliminating the possibility of "multisided" deviations) and moreover allows for arbitrary bargaining powers (each pairwise negotiation can for example be modeled using a cooperative solution such as Nash bargaining), but in essence it evacuates strategic issues by assuming that firms face "multiple personality disorder", their negotiating agents being unable to coordinate their actions.[8]

3. Simpler market structures

We are therefore still looking for a tractable framework for the analysis of multilateral relations, which does not introduce drastic limitations on the class of contracts or firm behavior. To gain further insight, it is useful to review recent advances in the analysis of simpler market structures, with a single firm either upstream or downstream.

3.1. Common retailer

Consider first the case where competing manufacturers rely on a single, common retailer to distribute their goods. From Bernheim and Whinston (1985, 1998) and O'Brien and Shaffer (1997) we know that the manufacturers can then use this "common agent" as an effective coordination device. The intuition is that bilateral efficiency requires input prices reflecting marginal costs, which in turn makes the retailer a residual claimant on all sales and induces it to set retail prices at their monopoly levels. This insight is robust. In particular, it does not depend on the relative bargaining powers of the parties: the resulting industry-wide monopoly profit can be shared between the upstream and downstream firms using fixed franchise fees. The insight moreover applies to secret as well as to public contracts – since the retailer observes all contracts anyway –, and relies on relatively simple two-part tariffs that need not be contingent on market structure or involve a menu of options.

3.2. Common supplier

More interesting for our purpose is the case where competing retailers, say R_1 and R_2, deal with a single supplier M. The distribution of bargaining power then affects the analysis, as can be seen from the polar cases studied below.

3.2.1. Supplier power

Suppose first that M makes take-it-or-leave-offers to the retailers. In this case, M can sustain retail prices at the monopoly level by adjusting wholesale prices so as to offset downstream competitive pressure on retail margins, and use fixed fees to recover retail profits. Again there is no need for more sophisticated contracts, but contracts must be public: otherwise, as pointed out by Hart and Tirole (1990), M has an incentive to behave opportunistically, which prevents it from fully exploiting its market power. This, in turn, can induce the manufacturer to look for remedies (e.g., reputation, RPM, ...) or engage in foreclosure (through exclusive dealing, vertical integration, ...).[9]

3.2.2. Buyer power

The situation is different when the bargaining power lies downstream, R_1 and R_2 each offering a single (public) tariff to M. Marx and Shaffer (2007) – hereafter MS – show that the weaker retailer is systematically excluded in such a setting (see MS, Proposition 1)[10]:

Proposition 3. When each retailer offers a (public) tariff to the manufacturer, the weaker retailer is always excluded.

The intuition is that in any candidate equilibrium with two active retailers M must be indifferent between accepting both offers or only one; otherwise at least one of the retailers could ask for better terms. At the same time each R_j would benefit from exclusivity: the retailer's sales, on which it earns a positive margin, would be higher, while fixed payments would remain unchanged. Switching to exclusive dealing would thus increase M and R_j's joint profits, implying that there exists a mutually profitable deviation. The conclusion then follows directly if retailers can offer exclusive deals.

MS show that exclusive dealing offers can be replaced by simple three-part tariffs combining a constant unit price with a slotting fee (paid upfront by the manufacturer) and a conditional fixed fee (paid by the retailer if it eventually distributes the good) equal to the retailer's profit from exclusivity (see Fig. 2A). If such a contract is accepted, the retailer will eventually carry the product only if it obtains exclusivity, since it would not be able to recoup the conditional fee otherwise. This in turn implies that if the manufacturer accepts a retailer's offer it will reject the other retailer's offer, to avoid losing the upfront payment without any compensating revenue.

While this tariff relies on a down payment by the manufacturer (a "negative payment"), Miklós-Thal et al. (forthcoming) – hereafter MRV – show that the slotting fee can be replaced by offering a limited volume at cost, as illustrated in Fig. 2B. Exclusivity can thus be achieved even without slotting fees or any other form of below-cost pricing.

MRV also show that the exclusion result in MS relies on restricting the retailers to offer a single, non-contingent tariff. If the retailers can offer two options, one for exclusivity and one for non-exclusivity, then the industry-wide monopoly outcome can be sustained in equilibrium. To see this, suppose that each R_j offers the following two options:

- for exclusivity, a simple two-part tariff yielding the bilateral monopoly profit Π_j^m that M and R_j can achieve alone;

[7] Limiting the class of tariffs also avoids equilibrium multiplicity when RPM is introduced.

[8] O'Brien and Shaffer (1992) adopt the related notion of "contract equilibrium" (where each bilateral contract best responds to the others) to study the behavior of a monopolistic manufacturer dealing with two retailers. While they characterize the unique such equilibrium outcome, Rey and Vergé (2004) show that it survives multilateral deviations by the manufacturer only if the retailers are quite differentiated.

[9] See also O'Brien and Shaffer (1992), McAfee and Schwartz (1994) and Rey and Vergé (2004). Rey and Tirole (2007) offer an overview of that literature and its implications for foreclosure.

[10] The result extends to more than two retailers, in which case at least one retailer is excluded.

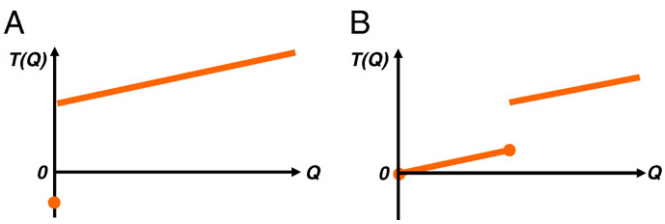

Fig. 2. Three-part tariffs.

- for non-exclusivity, a three-part tariff combining a wholesale price designed to sustain the industry monopoly profit Π^m with a conditional fixed payment, paid by R_j only if it eventually distributes the good and equal to its equilibrium downstream profit, and an upfront fixed payment by M (e.g., a slotting fee) that gives R_j its contribution to industry profits, $\Delta_j \equiv \Pi^m - \Pi^m_{-j}$.

Accepting both retailers' offers yields the industry monopoly outcome, and M is indifferent between accepting both offers or only one: either way, it obtains

$$\Delta_M = \Pi^m - \Delta_1 - \Delta_2 = \Pi^m_j - \Delta_j = \Pi^m_1 + \Pi^m_2 - \Pi^m > 0.$$

In addition, no $M-R_j$ pair can gain from excluding the rival retailer, since in equilibrium the pair already earns the bilateral monopoly profit Π^m_j. It cannot gain either from undercutting the rival retailer, who obtains its contribution to industry profits, Δ_j, through the manufacturer's upfront payment and has the option to remain inactive afterwards.

The retailers can thus use the common supplier as an effective coordination device. Several key ingredients are required, however. First, contracts must be public, or at least become public before downstream competition takes place. Otherwise, each retailer has an incentive to offer a cost-based, bilaterally efficient contract, and retail competition would drive consumer prices down.

Second, downstream competitors must be the ones who eventually determine (prices or) quantities: if the upstream firm chooses quantities, as in the bidding games studied by Martimort and Stole (2003) and Segal and Whinston (2003), a competitive outcome emerges, in which each retailer free-rides on its rival's margin. Such free-riding becomes less attractive when the rival retailer can react through its behavior in the downstream market.

Third, deviations must trigger "drastic" responses[11]: wholesale tariffs generating "smooth" best responses to rivals' strategies cannot maintain the monopoly outcome, as each retailer has an incentive to undercut its rival's monopoly price marginally.[12] Conditional fixed fees, equal to the retailers' equilibrium downstream profits, play a key role in generating such drastic responses: any undercutting by its rival leads a retailer to "opt out", that is, to drop the brand and waive the fixed fee.[13] Alternative means to eliminate competition include other (discontinuous) tariffs; in particular, while the above options involve down payments by the manufacturer, it is also possible to use tariffs that do not require any "negative payment" or below-cost pricing. When retailers compete in prices, yet another way consists in squeezing retail margins through RPM provisions (price ceilings, actually), thereby eliminating any scope for free-riding.

Finally, retailers must offer several options. MRV considers contracts including an option explicitly conditional on exclusivity but, as pointed out by Rey and Whinston (2010), a menu of tariffs (including one designed for exclusivity but not explicitly conditional on it, in the spirit of the three-part tariffs introduced by MS) works as well. Alternatively, allowing for contingent options can be interpreted as a short-cut for the renegotiations that might occur if the market structure turns out to differ from the expected one. Bedre (2007) indeed obtains similar efficient coordination results using the sequential bilateral bargaining framework proposed by Stole and Zwiebel (1996): R_1 and R_2 negotiate in sequence with M, but the first retailer renegotiates again (from scratch) if the second negotiation breaks down.[14] One advantage of this approach is that it accommodates arbitrary degrees of bargaining power in each bilateral negotiation.

4. Concluding remarks

The review of simpler market structures suggests two possible workable frameworks for the study of interlocking vertical relations, in which competing upstream firms each deal with competing downstream partners. A first approach consists in allowing firms to offer menus of options. They could for example design contracts that are contingent on which or how many supply channels are active. Mouraviev (2008) explores this possibility in a simplified 2 manufacturers–2 retailers network in which the firms' payoffs only depend on the structure of active links (which is not necessarily the one where all channels are active); manufacturers thus simply offer to deal, in exchange for a lump-sum transfer. He shows in this context that there always exists an efficient equilibrium when manufacturers can offer fully contingent contracts. However, even in this simple case contracts involve 8 options (stipulating different transfers for each of the configurations in which the manufacturer–retailer link is active), so while fully contingent contracts may be quite effective in sustaining cooperation, they may also be implausible—if not illegal. Alternatively, contracts could simply be contingent on whether the relationship is exclusive (for the upstream firm, or for the downstream one, or for both). Of particular interest may be the restriction to menus of options designed for alternative configurations without being explicitly contingent on them.

The sequential bilateral bargaining framework of Stole and Zwiebel (1996) provides another promising avenue. de Fontenay and Gans (2007) follow that approach to study the case where contracts are secret (firms holding passive beliefs about all other contracts when receiving out-of-equilibrium offers) and directly stipulate final quantities. They consider two situations, in which firms bargain sequentially over contracts that are either non-renegotiable but fully contingent, or non-contingent but renegotiable (from scratch) whenever one of the subsequent negotiations breaks down. In both cases, the equilibrium is bilaterally but not globally efficient, and the outcome corresponds to the Myerson–Shapley value.[15] Characterizing the outcome when upstream firms compete in public tariffs remains an open question.

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[11] We thank Michael Whinston for raising this point.
[12] See the discussion in Section 4.1 of MRV.
[13] de Fontenay and Gans (2005a) show that the same mechanism also solves the above-mentioned opportunism problem when M makes secret contract offers, provided contracts are observed before downstream competition takes place.

[14] Considering renegotiations "from scratch" reduces the scope for commitment effects, which may otherwise encourage the first negotiators to depart from efficiency in order to gain a strategic advantage in subsequent negotiations.
[15] de Fontenay and Gans (2005b) use the same approach to study the impact of vertical integration.

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