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LOSS-LEADERS BANNING LAWS AS VERTICAL RESTRAINTS

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LABORATOIRE D'ECONOMETRIE

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Résumé: Cet article étudie un effet pervers inflationniste de l'interdiction de la revente à perte. Dans un modèle où un producteur en monopole vend son produit par l'intermédiaire de distributeurs différenciés, nous montrons que l'interdiction de la revente à perte peut permettre au producteur de limiter la concurrence intra-marque et d'améliorer son profit en augmentant son prix de gros, rétribuant les distributeurs par le biais des marges arrière. L'interdiction de la revente à perte transforme le prix de gros en prix-plancher, augmentant le prix de détail et diminuant le surplus des consommateurs.

Abstract: This paper explores the indirect inflationary mechanism allowed by loss leaders banning laws. In a model where a monopolist producer sells his product through vertically separated and differentiated retailers, we show that the ban of resale at a loss can be used strategically by the producer to increase his wholesale price and pay the retailers through negotiated listing fees, thus raising his profit. The ban turns wholesale prices into floor prices, thus increasing resale price and lessening consumers' welfare.

Mots clés : Relations verticales, Revente à perte, Distribution, Marges arrière

Key Words : Vertical Restraints, Loss Leaders, Retail Industry, Slotting Allowances

Classification JEL: K12, K21, L13, L42.

1 Introduction

Below-cost pricing or "loss leading" is a pricing strategy used by powerful retailers as part of supermarkets' price war: they make (apparent) losses by selling some products at a price below their cost, to attract consumers in their shops. Yet selling some products at below-cost prices may be damaging to small competitors who can't afford to sell at such low margins, or to small suppliers, and in particular, in the market for fresh products, farmers who have a limited bargaining power and are forced to supply their products at low prices. On the other hand, retailers claim that such a strategy is good for consumers as it reduces prices, at least on some products. The global impact of such a strategy on prices and welfare, as well as its consequences on the share of profits among firms, are difficult to assess.

Loss-leader pricing strategies may have several different motivations. A large literature in industrial economics has been devoted to analyse such pricing strategies, and points out three main types of explanations. The most classical view is that a below-cost price can be used for predatory purposes: in a dynamic setting, a firm may choose to set her price below her cost (thus realizing losses) in a first period to eliminate her rivals and then benefit from the monopoly profit in a second period (see for instance Milgrom and Roberts [1982], or Telser [1966]). Yet loss leading may also simply result from optimal pricing by a multi-product retailer, without predatory purposes (see Ramsey [1927], Bliss [1988], or Chambolle [2004]): if there exists complementarities between products, below-cost pricing on some products may be optimal for a monopolist, in order to increase the demand for complements goods sold with positive margins. The third explanation is that loss leading with advertisement may be used to attract consumers imperfectly informed about prices and supporting shopping costs, thus increasing the quantities sold and the welfare (Lal and Matutes [1994], Gerstner and Hess [1987]). Following the same basic idea, Whalsh and Whelan [1999] prove that when retailers are differentiated by their location around a circle and when consumers have information about prices of some of the products but not all, retailers sell at a loss some products whose prices are known by consumers to attract them, and then set their monopoly prices for some other goods. In such a case, to resell goods at a loss is a way to compensate consumers for their imperfect information. Finally, below-cost pricing by a retailer may have good and bad consequences, and the literature does not conclude simply to assess this practice. Thus it is difficult to decide whether it should be allowed or not.

Yet in a context where large retail chains dominate the market and have much bargaining power towards their suppliers, retailer power has become an important issue for many governments (see for instance the British Office of Fair Trading's investigation in 1999 or the French Conseil de la Concurrence report in 1997). Overall increasing retailer concentration as well as the development of own brand products[1] have brought increased buying power that often led to conflicts between the various actors in the system, mostly producers, retailers and consumers (see Dobson et al. [2002]). Public policies aim at resolving such conflicts, and controlling vertical contracts and pricing practices has become a target for competition policy. Within the European Union, Article 86 of the Treaty of Rome prohibits any "abuse of a dominant position", and pricing practices resulting from such an abuse may be condemned as anticompetitive. For instance, in 2000 in Germany, the Cartel Office ordered Wal Mart, Aldi and Lidl to stop selling staples like milk and butter below-cost, as it was hurting competition and could drive some smaller shops out of business. In that case, loss leading was more or less viewed as a predatory pricing strategy. But some countries have gone farther in adopting special laws preventing retailers from selling merchandise below cost, thus setting up *per se* ban of below-cost pricing for retailers. In particular, below-cost pricing for retailers is prohibited in Belgium, France, Ireland, Portugal and Spain, and it is also prohibited for some products such as gasoline in some States in the United States[2]. In this paper we focus on *per se* ban of below-cost pricing for retailers.

In France, a specific law aiming at restoring the balance in producers-retailers relationships has been implemented in 1997 : the Galland law. Among other measures, this law prevents retailers from setting the price of a good below a threshold defined as the unit price invoiced by the supplier of the good plus the transport cost. below-cost pricing by retailers was already banned before that law but the threshold was not clearly defined, and the Galland law provides a very accurate definition of the threshold which excludes all the anticipated rebates and reductions that are not already on the bill at the time of delivery. In particular, all slotting fees that are negotiated on an annual basis at the end of the year cannot be integrated in the threshold. This definition is approximately the same that is used in other countries[3]

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[1]See Berges-Sennou, F. Bontems, P. and Réquillart, V. [2004].

[2]Moreover, in California, pricing below cost sales is prohibited when the motive of such a pricing is to promote the sales of other merchandise (cf. Eckert and West [2003]).

[3]The prohibition on below-cost selling imposed in the Republic of Ireland in 1987 uses a similar

where below-cost legislation exists. The following figure gives a more precise view of what can be considered as the "unit price" threshold.

Retailers' margin and price threshold
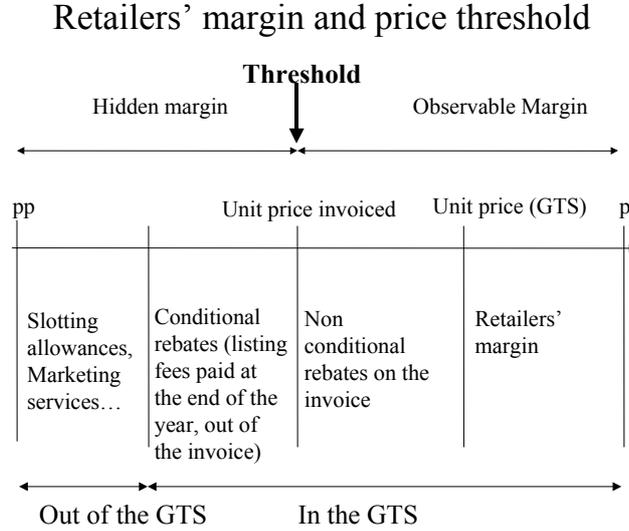
The rebates we call "hidden margins" are very important indeed, and the following table summarizes some French data on how supermarkets' margins are split up between observable and hidden margins in 1995 and 1999 (as a percentage of total margin): on average, for most products, hidden margins are the largest part of supermarkets margins, and in fact they express the bargaining power of large retail chains. Negative figures in the "observable margin" column indicate that these items were "loss leaders" sold at below-cost prices.

Product category	Observable / Hidden margin	
	1995	1999
Grocery	26/74	12/88
Fresh and dairy products, frozen items	50/50	34/66
Cosmetics, detergents	-6/106	14/86
Drinks	-1/101	11/89
Other non-food	61/39	56/44

threshold for below costs, as being the net invoice cost, excluding all off-invoice rebates.

To progress in ascertaining the impact of the below-cost legislation, it seems interesting to answer the following question: could a ban of loss leaders have adverse effects in itself? The question we address in this paper is the effect of such a ban on prices. Of course, the law has an obvious direct effect: it forces the retailers to increase the prices of the goods that were previously sold at below-cost price. So the price of former loss leaders naturally increases at the time the law is enforced. But this effect is limited to the prices of loss leaders, and it can be compensated by a decrease in the prices of other items if the multiproduct retailer follows an optimal pricing strategy. Finally, the effect of the ban on prices, on average, is ambiguous and it is difficult to conclude about the global impact of the law on average prices, as we lack theoretical basis. Some empirical evidence is offered in the Irish case by Collins *et al.* (2001), who examine the impact of the ban on below-cost selling of certain products since 1988 and show that the law had a significant positive influence on retail gross margins on a basket of grocery products. In the French case, several empirical studies gave different conclusions. A first statistical measure was led by the panellist Nielsen. It launched the debate by showing an average increase of 4.14% of the prices of 1500 items, all national brands, in two months after the application of the law. But a counter-test led by the Ministry of Economics concluded that, during the same period, the increase was only 0.5%, on average: however, this study took into account not only national brand items, but also private labels and discount brands for each product.

In this paper, we focus on a potentially inflationary mechanism of the ban. Our intuition is that the ban of below-cost pricing for retailers could allow a producer to impose floor pricing constraints that could be used strategically as a price-increasing vertical restraint. We present and solve the model in section 2. Section 3 proposes some extension to the cases where (1) listing fees are two-part tariffs and (2) bargaining issues are observable ex post. Section 4 concludes.

2 The model

Consider a market for a homogeneous good produced by a monopolist P. The producer cannot sell directly to the consumers and has to sell the good through a downstream independent retail industry, where two differentiated retailers 1 and 2 are competing in prices. We assume that the retailers do not transform the good and

that they resell each unit with zero retailing cost. We also normalise producing costs to zero without loss of generality. We denote q_i the quantity and p_i the price of the good sold by retailer i ($\{i, -i\} = \{1, 2\}$) on the final market. We assume that the inverse demand of the consumers for the good at i's shop is as follows:

$$p_i = 1 - q_i - bq_{-i} \tag{1}$$

Parameter b ($b \in [0, 1]$) measures the degree of substitutability of the retailers: even if the good is homogeneous, customers differ in their store preferences and b represents the intrabrand competition when the two retailers offer the same product.

Vertical contracting between the producer and his retailers is modelled following the real timing of vertical negotiations. In most countries, commercial laws require general terms of sale to be public and non-discriminatory. We thus assume that the producer has to publish his (unit) wholesale price w before any negotiation with his retailers. This wholesale price is the same for both retailers 1 and 2. Once the wholesale price is published, the two retailers secretly and simultaneously bargain with the supplier over rebates, which we call generically "listing fees", transferred from the producer to each retailer. We assume that the fees are bilaterally negotiated following a Nash bargaining process, which seems consistent with the reality of vertical negotiations (Allain and Chambolle, 2003). The producer has the same exogenous bargaining power denoted α ($\alpha \in [0, 1]$). These fees are assumed to be proportional to the quantities exchanged (we test the robustness of our results to this assumption in section 3.1 where we assume that the fees are two-part tariffs), and paid after some delay, for instance at the end of the year: under a ban of loss leaders as the Galland law for instance, it implies that these fees cannot be deduced from the reference price which excludes all the anticipated rebates and reductions that are not already on the bill at the time of delivery. Under the ban, the retailers thus cannot sell the good at a price below the threshold w. In the last stage, wholesale prices and listing fees are common knowledge, and retailers compete on the product market. The timing of the game is as follows:

Stage 1: The producer sets his wholesale unit price w.
Stage 2: Unit listing fees f_i, $i \in \{1, 2\}$ are secretly and bilaterally negotiated.
Stage 3: Retailers compete in prices.

Let us depict the bargaining process more precisely. We follow Horn and Wolinsky (1988) by assuming that the firms have "passive beliefs". If retailer i does not come

to an agreement with the supplier, it does not affect the issue of the other pair's negotiation: the disagreement point corresponds to a situation where the other pair operates at the anticipated equilibrium level. This assumption is common in literature on secret multilateral negotiations[4]. It is quite intuitive that the retailers negotiate competitively and thus each one do not know the outcome of the other pair's negotiation at the time of bargaining. It could seem more surprising that this assumption also applies to the producer, but it simply means that the producing firm sends two commercial agents to negotiate on the same day with different retailers, and that each of them ignores the outcome of the other's negotiation: this is not an unrealistic assumption. Furthermore, in the basic model we assume that the issue of a negotiation in stage 2 is non observable ex-post by the retailers, so that the firms do not adapt their strategies in the last stage: none of them knows whether the negotiation between the supplier and the competitor succeeded or not, and each of them believes that the other pair's negotiation led to the equilibrium outcome. However we show in section 3.2 that our results are robust to changes in this assumption about observability.

We solve the game for its symmetric subgame-perfect Nash equilibria, comparing the outcomes of the game with legal constraint (ban of below-cost pricing) to those in the benchmark case (without the ban).

2.1 Equilibrium in the game with no legal restriction

The last stage of the game determines the optimal retail prices as a function of the wholesale price w, and of the two values of the listing fees f_i, $i \in \{1, 2\}$ (see appendix $A1$):

$$p_i = \frac{2(1 + w - fi) + b(w - f_{-i}) - b - b^2}{4 - b^2} \tag{2}$$

Anticipating these downstream prices, the resolution of the second-stage Nash program gives the optimal values of the listing fees. Interestingly, the anticipated profit of the producer in the first stage does not depend on the wholesale price: there is a continuum of solution pairs (w^*, f_i^*) for $i \in \{1, 2\}$, satisfying the Nash conditions. All the solutions lead to the same net transfer $w^* - f_i^*$ from retailer i to the producer. The equilibrium net unit price $w^* - f_i^*$ paid by retailer i to the producer is strictly

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[4]For a detailed presentation of different sets of beliefs and among others the passive beliefs, see McAfee and Schwartz (1994).

increasing in the producer's bargaining power α:

$$(w - f_i)^* = \frac{\alpha(2 - b - b^2)}{2(2 - b^2 - b\alpha))} \tag{3}$$

In fact, there is no commitment value of the first stage of the game, as the outcome of the game is completely determined in the second stage by the negotiation of the listing fees. Equilibrium downstream prices are then positive and smaller than 1 :

$$p_i^* = p^* = 1 - \frac{(2 - b^2)(2 - \alpha) - b\alpha}{2(2 - b)(2 - b^2 - b\alpha)} \text{ for } i \in \{1, 2\} \tag{4}$$

Depending on the value of f_i^*, p^* may be higher or lower than the wholesale price w^*: this equilibrium may be with or without below-cost pricing. Furthermore, the higher $w^* - f_i^*$ is, the higher the final price p^* is, according to the double-marginalization effect. Thus, the final price is also a strictly increasing function of the producer's bargaining power α. Moreover, final prices and retailers' profit are decreasing in b, the intensity of competition between the retailers. Interestingly, the net unit price $w^* - f_i^*$ paid by retailer i to the producer as well as the profit of the producer also decrease in b : by lowering final prices, retailers' competition reduces the "pie" of total profits and even the producer's margin and profit.

2.2 Forbidding below-cost pricing

Let us now consider the case where below-cost pricing is prohibited. The pricing strategies of the retailers are then constrained: they have to set retail prices above the wholesale price. We look for situations where the producer uses the ban to constrain his retailers' pricing strategy. In that case, if the constraint is really binding, the producer anticipates that the two retailers will have to set zero margins and that retail prices will be $p_1 = p_2 = w$. He thus sets in the first stage the wholesale price w in order to maximise the total profit he will have to share with his retailers in the second stage: $\widetilde{w} = p_1 = p_2 = \frac{1}{2}$.

This partial result is quite intuitive, as if the contraint is binding, then each retailer sets her retail prices equal to the wholesale price, and gets profit only through the listing fee. The producer behaves then as a vertically integrated firm. We denote this strategy as "floor pricing" strategy. We now have to determine in which cases the constraint is really binding, *i.e.* when the retailers' interest is indeed to set zero margins. In such cases we will say that the strategy "exists" and this will happen

when the optimal price chosen by the producer, $\widetilde{w} = 1/2$, is on the decreasing side of the retailer's profit function ($\widetilde{w} \geq p^*$). Afterwards, we will have to check that, when the strategy exists, the producer finds it profitable to choose it rather than another non-binding wholesale price leading to the downstream prices p^*.

Lemma 1 *The constrained equilibrium candidate exists only if the producer has little bargaining power.*

Proof : see appendix A2. ∎

For small values of α, the optimal constrained wholesale price is higher than the optimal non constrained retail price, so that the constraint is really binding. This lemma is quite intuitive since on the one hand the optimal constrained wholesale price is independent of α, while on the other hand the optimal final price in the unconstrained case is an increasing function of the producer's bargaining power. In the unconstrained case, the optimal resale price is an increasing function of the producer's bargaining power: the unit net margin of the producer, $w^* - f_i^*$, increases with α. Yet this increase is partially passed on to the consumers by the retailers who set higher resale prices, increasing their margins to the detriment of the total profit of the industry. This is a classical double-marginalization effect.

More precisely, the constraint is binding for the retailers if and only if the producer's bargaining power is less than a threshold: $\alpha \leq \overline{\alpha_e} = \frac{b(2-b^2)}{2-b}$. The threshold $\overline{\alpha_e}$ is always in the interval $[0, 1]$. Furthermore, $\overline{\alpha_e}$ is increasing in b, $\overline{\alpha_e} = 0$ for $b = 0$ and $\overline{\alpha_e} = 1$ for $b = 1$: the floor pricing strategy exists for larger values of the producer's bargaining power when retailers' competition is fiercer. The intuition behind this result is as follows. On the one hand, in the unconstrained case, for a given α, the fiercer the competition between retailers is, the lower is the final price p^*. On the other hand, in the constrained case, the level of the unit price defined in the general terms of sales of the producer is independent of b as the rule eliminates downstream competition. Thus naturally, the condition on α for the constrained equilibrium to exist is less binding as the competition is fiercer (as b increases).

To know whether this candidate is indeed an equilibrium, it has to be profitable for the producer to choose the associate value of the wholesale price in the first stage of the game. We study the profitability of the strategy in appendix.

Lemma 2 *The floor pricing strategy is always profitable for the producer when it exists.*

Proof : see appendix $A2$. ∎

The producer always benefits from this strategy. In fact, as we mentioned, this floor pricing strategy allows the producer to maximise the joint profits of the vertical structure, but it also has an impact on the sharing of the profit among the firms. Considering b as given, the share of the profit captured by the producer $\left(\frac{\Pi_P}{\Pi_P+2\Pi_D}\right)$ naturally increases in α. Yet in the unconstrained case (1), because the producer negotiates the fees f_i in order to maximize his own profit, there is a double-marginalization externality also increasing in α. Thus the bargaining affects both the sharing of the profit and the total joint profits. More precisely, the producer's profit share in the unconstrained case is $\frac{\Pi_P^*}{\Pi_P^*+\Pi_1^*+\Pi_2^*} = \frac{(2-b)(2+b)\alpha}{(2(2+\alpha)-b(2b+\alpha))}$. In the constrained case (2), as the bargaining only determines the sharing of profits, the producer's profit share is $\frac{\widetilde{\Pi_P}}{\widetilde{\Pi_P}+\widetilde{\Pi_1}+\widetilde{\Pi_2}} = \alpha$. The following figure represents the evolution of the producer's profit share in both cases for a given value of the parameter b.
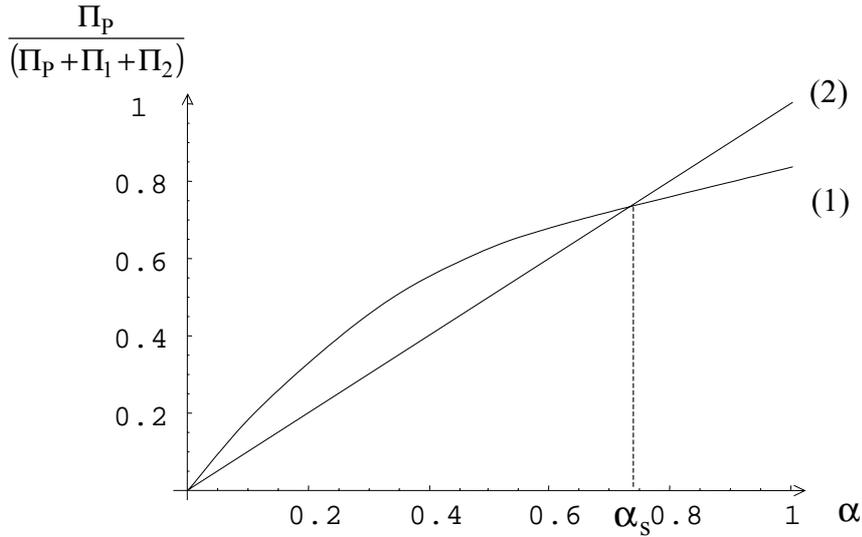
Producer's share of total profit

A new threshold $\alpha_s = \frac{b^2}{2-b}$ appears (notice that $\alpha_s < \overline{\alpha_e}$). If $\alpha \in [0, \alpha_s]$, the floor pricing strategy reduces (resp. raises) the share of total profits the producer (resp. a retailer) captures, while if $\alpha \in [\alpha_s, 1]$ the floor price strategy raises (resp. reduces) the share of total profits the producer (resp. a retailer) captures. This result comes

directly from the double-marginalization effect. In fact, when α is close to zero, a rise in the producer's bargaining power first benefits in a greater extent to the total joint profit as it allows a relaxation of the downstream retailing competition[5]. Thus the producer is able to capture a share of total profit that is larger than α. But, for higher values of α, a rise in the producer's bargaining power leads to a stronger double-marginalization effect that gradually becomes harmful for total joint profits. Anticipating this negative effect, the producer limits the exercice of his negotiation power and thus captures a share of total profit smaller than α. However, we proved that the floor pricing strategy is always profitable for the producer: when $\alpha \in [0, \alpha_s]$, the positive effect of this strategy on the total joint profits always prevail over the negative effect on producer's profit share. If we now compare retailers' profits in both cases, we show that there exists a new threshold $\overline{\alpha_r}$ (with $\alpha_s < \overline{\alpha_r} < \overline{\alpha_e}$) such that the floor pricing strategy is profitable for retailers only if producer's bargaining power is not too strong: $\alpha < \overline{\alpha_r}$. Thus, even if the producer uses this strategy to relax downstream competition, this strategy may be harmful for retailers when double-marginalization effect becomes too high.

Proposition 3 *The ban of loss leaders leads to higher prices for small values of the producer's bargaining power.*

Proof : see appendix $A2$. ∎

More precisely, the floor pricing strategy is chosen by the producer in equilibrium for $\alpha \leq \overline{\alpha_e} = \frac{b(2-b^2)}{2-b}$. In that case, each retailer i negotiates a share $\frac{1-\alpha}{2}$ of the vertically integrated structure's profit, and sets a zero margin in the third stage: $\widetilde{p} = \widetilde{w} = 1/2$. The final price is then higher than in the benchmark equilibrium, without the legal constraint. The ban of below-cost pricing can be used as a mean to increase the total profits of the industry to the detriment of the consumers, even in situations where there would not necessarily be loss leaders in equilibrium without the ban: as we have seen in section 2.1, in the absence of below-cost legislation, the final price in equilibrium would be the same with or without below-cost pricing. The ban in itself allows the producer to set a floor price[6], thus reducing retailers' competition as would

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[5]This effect is also pointed out in the extension with two-part tariff hidden margin, since as two-part tariff usually allows to eliminate entirely double-marginalization effect, we show here a (small but) positive effect of double marginalization, which may be sometimes profitable for the whole vertical structure.

[6]Furthermore, this effect is robust to the introduction of substitute products by the same producer (see Allain and Chambolle, 2004).

a vertical restraint like resale price maintenance.

3 Robustness and extensions

3.1 Two-part listing fees

In this section, listing fees are assumed to be two-part tariffs: the marginal component is denoted f'_i and the fixed fee F'_i. Just as with linear tariffs, there is no commitment value for the wholesale price in the first stage of the game since the outcome is completely determined in the second stage by the bargaining over the listing fees. As in section 2, the equilibrium of the game is defined by the "real" unit price paid by the retailer to the producer, that is the difference $w' - f'_i$. The equilibrium does not depend on the repartition between the input price w' in the general terms of sales and the unit price paid through hidden margins f'_i. Since the fixed part F'_i determines the sharing of the vertical structure's profit, the level of f'_i simply maximizes the vertically integrated structure's profit. In equilibrium, f'_i would be zero if competition between retailers were perfect and positive as long as $b \in \,]0,1]$. Indeed, when retailers buy the goods at a strictly positive unit cost, the final prices they set are higher than if this buying unit price were null: a positive f'_i reduces the downstream competition between retailers and thus increases the total joint profits[7].

Proposition 4 .*The floor pricing equilibrium candidate always exists and this strategy is always profitable for the producer.*

Proof : see appendix A3. ∎.

The existence of the constrained equilibrium is now independent of the producer's bargaining power. In fact, when hidden margins are two-part tariffs, the producer's negotiation power α has no influence on the level of $w' - f'_i$. As we mentioned, with the fixed part F'_i, the producer captures a part α of the joint profits, the level of f'_i simply maximizes the vertically integrated structure's profit which is independent of α. Thus, whatever the producer's bargaining power towards retailers, the final price and thus the sum of all profits remains the same.

Moreover, in the linear pricing game, the constrained equilibrium existence is not always verified since the double-marginalization effect raises the final price p^* while

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[7]This result was highlighted by Shaffer (1991).

the constrained price is a constant $\frac{1}{2}$. On the contrary, in the two-part tariff case, even if double-marginalization is not entirely eliminated, it is considerably reduced, and p' is thus much lower while the constrained price is unchanged. Here, with or without the ban of below-cost pricing, the sharing of joint profits is unchanged: the producer captures a part α. However, the total profit is always increased in the constrained case, that's why the producer always benefits from this strategy. Our results are thus robust to a two-part tariff hidden margin specification. However, one result no more holds in the two-part tariff case: here, retailers always benefit from this producer's strategy.
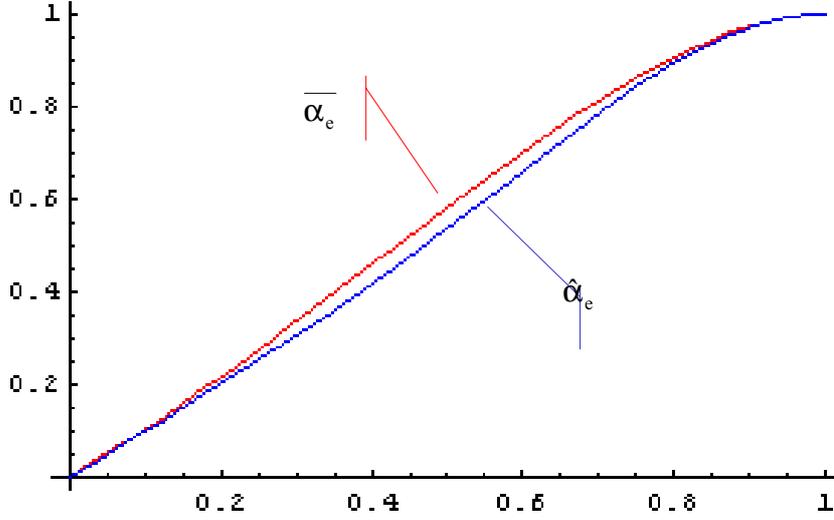
3.2 Bargaining assumptions

In this subsection, we assume that firms bargain bilaterally and secretly, but if previously one retailer could not observe if the bargaining between the two other parties had been successful or not, she now does. Thus, if the bargaining between retailer i and the supplier fails, retailer $-i$ observes this outcome in the last stage, and she may thus profitably renegotiate with the supplier in the new context where retailer $-i$ acts as a downstream monopoly. The disagreement point differs from the one developed in section 2.

Proposition 5 *The constrained equilibrium candidate exists if producer's bargaining power is not too high and if it exists, this strategy is always profitable for the producer.*

Proof : see appendix A4. ∎.

More precisely, we show that there exists a threshold $\widehat{\alpha}_e(b)$, such that the constrained equilibrium exists when $\alpha \leq \widehat{\alpha}_e$.

Comparison of thresholds

In the above figure, we compare our threshold $\widehat{\alpha}_e(b)$ (in blue) to the threshold $\overline{\alpha_e}(b)$ (in red) obtained in section 2. We easily prove that $\overline{\alpha_e}(b) \geq \widehat{\alpha}_e(b)$ whatever the value of the parameter b. In fact, this new assumption on bargaining only reinforces the producer's status-quo all other things being equal. At a given level of α, the producer is able to set a higher real unit price $w - f_i$ than in our benchmark case of section 2. Thus double-marginalization is reinforced and the final price $\widehat{p}$ is here higher than p^*. Concerning the constrained equilibrium, as double-marginalization disappears, this new specification of bargaining only affects the sharing of profits between the producer and the retailers, but the final price is unchanged. Thus, the new threshold for constrained equilibrium existence is lower. However, we have here proved that our results are qualitatively robust to this new specification.

4 Conclusion

In this paper, we address the question of the impact of below-cost pricing legislation on producers and retailers' conduct. We highlight an adverse effect of the ban of below-cost pricing on prices, and show that the ban can be misused by a supplier as a vertical restraint reducing intra-brand competition, in order to raise his profit to the

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detriment of consumers, and in some cases to the detriment of retailers. The ban allows a producer to indirectly impose a floor price to his retailers, which paradoxically could constitute in itself a break of the competition laws in Europe as well as in the United States. This adverse effect of below-cost pricing laws has been recently denounced by firms in some countries like France and Ireland, where national brand suppliers were accused by retailers to raise their prices in the general terms of sale, compensating the retailers through higher hidden margin but limiting their competition strategies. We show that this effect may lead to higher retail prices if the producer's bargaining power is not too high, but also that the intensity of retail competition facilitates the use of this strategy by the supplier. Furthermore, the ban's inflationary adverse effect appears even in situations where there would not necessarily be below-cost pricing in equilibrium without the legal constraint: this element clearly supports the use of a rule of reason rather than a per se ban of below-cost pricing by retailers.

Our model proposes an original analysis of contracts between producers and retailers. Although in most countries there are, on one side, general terms of sale imposed by producers, and on the other side, a more or less observable negotiation on commercial services, listing of products, slotting allowances, discounts and rebates, the economic literature has mainly focused on simple linear pricing contracts as well as some simple vertical restraints. Among theses vertical restraints, the mostly studied in the literature are two-part tariffs, resale price maintenance, quotas or exclusive territories. Shaffer (1991) proposed a theoretical analysis of slotting allowances, but his formalization is similar to that of two-part tariffs. Here we try to approach the real timing of vertical negotiations, and we take into account a bargaining of contracts very closely related to those existing between producers and retailers. Thus we introduce a sequentiality between the setting of general terms of sale by the producers and the negotiation of what we call the "hidden margin". This timing allows a better understanding of producers-retailers relationships.

Of course, the conclusions of this study have been obtained in a simple setting, and have to be balanced against other potential effects of loss leading. The global effect of the ban of below-cost pricing by retailers should be measured according to several dimensions. A global assessment of the law was beyond the scope of this study, but we provide elements that contribute to the policy debate. Further research on that topic could help public policy makers to be better advised of the consequences of such legislation. In particular, the influence of the ban on the firms' behaviour in a broader context including inter-brands competition seems an interesting field for

further research. In a joint paper (Allain and Chambolle, 2004), we study the pro-collusive effects of the ban in the case of competing vertical structures. The analysis would also benefit from the integration of own brand products in the basket of goods, to investigate the cross effects of the producer's decision on other products prices and market shares.

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A   Appendix

A.1   Equilibria of the game without constraint

We solve the game by backward induction. We look for symmetric equilibria only. Consider the subgame where listing fees f_i, $(i = \{1, 2\})$ and the wholesale price w are fixed. Each retailer i anticipates downstream demands $q_i(p_i, p_{-i})$, and maximises her profit:

$$\underset{p_i}{Max}\Pi_i = (p_i - w + f_i)q_i. \tag{5}$$

Given the assumed linearity of the demand function, this profit function is concave. The sufficient first order conditions determine the optimal prices p_i $(i = \{1, 2\})$ chosen by the retailers as functions of $(w - f_i)$: $p_i = \frac{2(1+w-f_i)+b(w-f_{-i})-b-b^2}{4-b^2}$.

The second stage of the game is the Nash-bargaining over the listing fees. The Nash program of the negotiation between the producer P and retailer i is as follows:

$$\underset{f_i}{Max}(\Pi_P - \Pi_P^{sq})^\alpha (\Pi_i - \Pi_i^{sq})^{1-\alpha} \tag{6}$$

where α is the exogenous Nash bargaining power of the producer and $(1 - \alpha)$ the exogenous Nash bargaining power of the retailer, Π_P (resp. Π_i) is the profit of producer P (resp. retailer i) and Π_P^{sq} (resp. Π_i^{sq}) is the *statu quo* profit earned by producer P (resp. retailer i) if the negotiation fails , *i.e.* if producer P only deals with retailer $-i$ (resp. retailer i does not deal with the producer). Given the assumption that the firms have "passive beliefs", the *statu quo* profits are:

$$\begin{aligned}
\Pi_P^{sq} &= (w - f_{-i})q_j^*(w, f_{-i}^*, f_i^*). \\
\Pi_i^{sq} &= 0.
\end{aligned} \tag{7}$$

The simplified bilateral Nash program in the unconstrained case is written:

$$\alpha\frac{d\Pi_P}{df_i}[\Pi_i - \Pi_i^{sq}] + (1 - \alpha)\frac{d\Pi_i}{df_i}[\Pi_p - \Pi_P^{sq}] = 0. \tag{8}$$

The resolution of the Nash program gives a unique solution. Given the value of the wholesale prices, the optimum listing fees are:

$$f_i^* = w^* - \frac{\alpha(2-b-b^2)}{2(2-b(b+\alpha))}. \tag{9}$$

These values fully determine the producer's profit in the first stage. Downstream price is then the same at both retailers' stores, and is denoted p^* :

$$p^* = \frac{(1 - b)(2(2 + \alpha) - b(2b + \alpha))}{2(2 - b)(2 - b(b + \alpha))}. \tag{10}$$

Profits are:

$$\Pi_P^* = \frac{\alpha(1-b)(2+b)\left(4-b^2(2-\alpha)-2\alpha-b\alpha\right)}{2(2-b)(1+b)(2-b(b+\alpha))^2} \tag{11}$$

$$\Pi_i^* = \frac{(1-b)\left(4-b^2(2-\alpha)-2\alpha-b\alpha\right)^2}{4(2-b)^2(1+b)(2-b(b+\alpha))^2}. \tag{12}$$

A.2   Constrained equilibria

The simplified bilateral Nash program of the negotiation between producer P and retailer i is written:

$$\alpha\frac{d\widetilde{\Pi}_P}{d\widetilde{f}_i}\left[\widetilde{\Pi}_i - \widetilde{\Pi}_i^{sq}\right] + (1-\alpha)\frac{d\widetilde{\Pi}_i}{d\widetilde{f}_{Ki}}\left[\widetilde{\Pi}_P - \widetilde{\Pi}_P^{sq}\right] = 0. \tag{13}$$

The resolution of the Nash program gives the following optimal listing fees:

$$\widetilde{f}_i = (1-\alpha)\,w.$$

In the first stage, anticipating the constraint, the producer maximises his profit by fixing the wholesale price that maximises the profit of the vertical structure $(P, 1, 2)$. In equilibrium, the producer thus sets the following wholesale price:

$$\widetilde{w} = \frac{1}{2}. \tag{14}$$

We now have to verify that this candidate is indeed an equilibrium. We first check that it is optimal for the retailers to set $\widetilde{p} = \widetilde{w} = \frac{1}{2}$. They will set zero margins only if they are on the decreasing side of their profit function: the constraint has to be actually binding. We thus need to have $\widetilde{w} > p^*$ (else the retailers would benefit from setting positive margins). We study the difference $exist = \widetilde{w} - p^*$:

$$
\begin{aligned}
exist \;&\geq\; 0 \\
&\Leftrightarrow\; \alpha \leq \overline{\alpha_e} = \frac{b(2-b^2)}{2-b}.
\end{aligned}
$$

The constrained equilibrium profits are:

$$\widetilde{\Pi}_P = \frac{\alpha}{2\,(1+b)} \tag{15}$$

$$\widetilde{\Pi}_i = \frac{(1-\alpha)\,\widetilde{\Pi}_P}{\alpha}\frac{}{2}.$$

18

We now compare producer's profit in the constrained and unconstrained case, to determine which strategy he chooses in the first stage.

We study $\widetilde{\Pi}_P - \Pi_P^*$, the difference is always positive whatever the value of $b \in]0, 1]$ and $\alpha \in]0, 1]$.

Finally, the ban is used by the producer as a mean to impose a floor-price for $\alpha \leq \overline{\alpha_e}$ and in that case, the equilibrium is the constrained equiibrium where $\widetilde{p} = \widetilde{w} = 1/2$, the retailers sets zero margins and are paid through the negotiated fees.

A.3 Two-part listing fees

The optimal prices p_i $(i = \{1, 2\})$ chosen by the retailers as functions of $(w - f_i)$ are the same as in the previous section since the fixed fees do not change the first order conditions. However, in the second stage the Nash bargaining is influenced by the fixed fee F_i'. The equilibrium two part listing fees are:

$$F_i' = \frac{(2 + b)(b^2 - (2 - b)\alpha)}{16(1 + b)} \tag{16}$$

$$f_i' = w' - \frac{b^2}{4}. \tag{17}$$

The equilibrium marginal component f_i' does not depend on producer's negotiation power α. On the contrary, the equilibrium fixed fee F_i' decreases in α.

Since final prices only depend on f_i', their level will no more be influenced through α.

$$p_i' = \frac{2 - b}{4}. \tag{18}$$

And producer and retailers' profits are:

$$\Pi_P' = \frac{(4 - b^2)\alpha}{8(1 + b)} \tag{19}$$

$$\Pi_1' = \Pi_2' = \frac{(1 - \alpha)}{\alpha} \frac{\Pi_P'^*}{2}. \tag{20}$$

Let us now turn to the constrained case.

Just like in the previous section, equilibria with $p' > w'$ are destroyed by this constraint, and new equilibria may appear.

Candidates for constrained equilibria verify:

$$
\begin{cases}
p_1 \le w \\
p_2 \le w
\end{cases}
. \tag{21}
$$

The Nash bargaining is changed by the two-part tariff fee assumption.
The optimum listing fees are such that:

$$
\begin{aligned}
\widetilde{f_i'} &= (1 - \alpha)\, w \tag{22} \\
\widetilde{F_i'} &= 0.
\end{aligned}
$$

Thus in the second stage, there are an infinite number of two-part tariff equilibria. Replacing the optimum listing fees in the producer's profit function, we find that the optimal producer's wholesale price and profit are the same as those emerging without the fixed fee.

A constrained equilibrium exists if and only if $\widetilde{w} - p' > 0$. Comparing (14) and (18), we prove that whatever $\alpha \in [0, 1]$ and $b \in [0, 1]$, a constrained equilibrium always exists. Comparing (15) and (19), we prove that this strategy is always profitable for the producer.

A.4   Ex post observability of bargaining success and failure

We still assume that the firms bargain bilaterally and secretly, but now each retailer is able to observe, before stage 3, if the bargaining between the two other parties during stage 2 has been successful or not. Thus, if the bargaining between retailer i and the supplier fails, retailer $-i$ observes this outcome ex post, and thus may profitably renegotiate with the supplier in the new context where retailer $-i$ acts as a downstream monopoly. The disagreement point thus differs from the one developed in the paper. We here prove that our results are robust to this new specification.

The last stage of the game is unchanged. The second stage of the game is the Nash-bargaining over the listing fees but the new *statu quo* profits are:

$$
\begin{aligned}
\Pi_P^{sq^m} &= (w - f_{-i}^m) q_{-i}^m(w, f_{-i}^m) \tag{23} \\
\Pi_i^{sq^m} &= 0.
\end{aligned}
$$

$\Pi_P^{sq^m}$ is thus the profit realized by the producer when he bargains with a downstream monopoly. Solving the whole game in this bilateral monopoly context, we find that:

$$\Pi_P^{sq^m} = \frac{\alpha}{8}\left(2 - \alpha\right). \tag{24}$$

The resolution of the Nash program gives a unique solution: given the value of the wholesale prices, the optimum listing fees are $\widehat{f}_i = \widehat{w} - f(\alpha, b)$. Profits $\widehat{\Pi}_P$ and $\widehat{\Pi}_i$ do not depend on the wholesale prices.

We denote $\widehat{p}$ the equilibrium price.

When loss leaders are forbidden, retailer's pricing strategy may be constrained. In this case, we easily prove that status-quo are the same as those defined by (23) since the wholesale price $\overline{w}$ cannot be higner than p_{-i}^m (the status quo are never constrained).

$$\alpha \frac{d\overline{\Pi}_P}{d\overline{f}_i}\left[\overline{\Pi}_i - \Pi_i^{sq^m}\right] + (1 - \alpha)\frac{d\overline{\Pi}_i}{d\overline{f}_i}\left[\overline{\overline{\Pi}}_P - \Pi_P^{sq^m}\right] = 0. \tag{25}$$

The solution of the Nash program gives the following optimal listing fees:

$$\overline{f}_i = \frac{\alpha\left(1 + 4\left(1 - \overline{w}\right)\overline{w} + b\left(1 - \alpha\right) - \alpha\right)}{4\left(1 - \overline{w}\right)\left(2 - \alpha\right)}. \tag{26}$$

In the first stage, anticipating the constraint, the producer maximises his profit by fixing the wholesale price that maximises the profit of the vertical structure $(P, 1, 2)$. In equilibrium, the producer thus sets the following wholesale prices:

$$\overline{w} = \frac{1}{2}. \tag{27}$$

We now have to verify that it is then optimal for the retailers to set $\overline{p} = \overline{w} = \frac{1}{2}$. They will set zero margins only if they are on the decreasing side of their profit function. The constraint has to be actually binding for this candidate to be an equilibrium. The constrained equilibrium profits are denoted $\overline{\overline{\Pi}}_P$ and $\overline{\Pi}_i$.

Comparing $\overline{w}$ with $\widehat{p}$, we prove that such a constrained equilibrium exists if $\alpha \leq \widehat{\alpha}_e(b)$. The function $\widehat{\alpha}_e(b)$ is such that $\widehat{\alpha}_e(0) = 0$ and $\widehat{\alpha}_e(1) = 1$, and $\widehat{\alpha}_e'(b) > 0$. We easily prove that $\widehat{\alpha}_e(b) < \overline{\alpha}_e(b)$.