Exclusionary practices and entry under asymmetric information*

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Abstract

A firm entering a market often has to solve the problem that consumers do not know the quality of its product. The present paper, studying entry by a firm facing an incumbent rival, shows that the latter's reaction to entry can work as a substitute for the entrant's revelation costs. As a particular case, when firms use retailers to sell their goods, the incumbent can decide whether or not to apply an exclusive dealing clause. Since the incumbent's strategy entails enforcement of the clause only against a low quality entrant, shared retailing reveals to consumers that the entrant's quality is high, and the asymmetric information problem is solved. If the possibility of exclusion is prohibited, the equilibria with entry by the high quality are destroyed. More generally, the discretionary use of exclusionary practices, or of comparative advertising, can solve the asymmetric information problem for the entrant, thereby facilitating entry.

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1 Introduction

In the present paper we show that in markets where consumers have imperfect information about an entrant's quality, the possibility for an incumbent to use exclusionary practices may vehicle useful information to consumers. This information transmission through the discretionary use of a hostile action by the incumbent, like the use of exclusions, can enhance competition because it eliminates the incentive for the entrant to provide low quality. Information is transmitted at zero costs so that costly information devices that a high quality entrant should use can be disposed of.

We analyze in particular detail the application of exclusive dealing clauses in retailing as an example of exclusionary practices. Then we relate our results to similar phenomena. A producer can foreclose access to a retailing network *via* the imposition of exclusive dealing, but he can as well refrain from applying such clauses and let the entrant share the same retailers he is contracting with. The shared retailing outcome demonstrates unambiguously to consumers that the incumbent has not made use of exclusionary clauses. As we shall show, the incumbent prefers not to exclude if the rival is of high quality. The latter, indeed, can defend her own reputation, albeit at a cost, while a low quality cannot. But then if entry and shared retailing prevail, rational consumers should infer that the entrant produces high quality.

Two mechanisms come to mind why an incumbent might want to refuse to sell through a retailer together with a potential entrant of low quality: first, the established firm might gain a competitive advantage when unmasking a competitor to be of low quality; second, the established firm might loose reputation when selling jointly with an entrant of low quality. It depends on the particular market one has in mind whether one prefers the first or the second explanation. In this paper we take the first mechanism. Hence, we consider a market in which the quality of the incumbent is known with certainty, as it is the case after an investment in reputation, and cannot suffer from entry. We do not model how an incumbent builds up reputation and simply assume that he has perfectly revealed quality by certifying it. Still, the incumbent is not indifferent as to sharing his reputation because a higher reputation of the competitor reduces his market power.

As to the second mechanism, that reputation can suffer, note that the possibility to exclude competitors from a distribution channel provides a mean to protect the manufacturer(s') brand image or quality recognition from free-riding by other firms (see Bork, 1978). This idea has already been discussed in various places in the literature (e.g. Ornstein, 1989). Similarly, exclusive dealing protects the manufacturer's property rights on product design when competitors could free-ride by supplying imitations to the same retailers (Marvel, 1982).

The point that exclusionary practices are mainly used as efficiency enhancing devices has been stressed by the Chicago Law School (Posner, 1976, Bork, 1978). A rich body of theory follows this idea (see Bernheim and Whinston, 1998 and the references therein). This stands in contrast to the conclusion that contractual vertical restraints be anticompetitive (for instance, Comanor and Frech, 1985) because they could provide a commitment to foreclose entry.[1] Non-price vertical restraints are particularly controversial in highly concentrated markets with substantial barriers of entry. Since incumbents have already sunk their entry costs, and they have usually granted for themselves the use of the necessary distribution channels, they can be suspected to intentionally try and raise entrants' costs by imposing exclusive dealing clauses.

Adding to the debate on the competitive effect of exclusionary practices the present paper focuses on the role of asymmetric information. Under perfect information, in our model, no exclusionary clauses would be applied at equilibrium and the possibility to use them or not would be neutral to the final outcome. This is not the case under asymmetric information. Indeed, if the incumbent cannot pre-commit to the exclusionary practice, he will base his action upon his information about the entrant's quality. But then, by observing the incumbent's action, consumers can infer the entrant's quality.

The reasoning driving the result is essentially as follows (for the sake of simplicity we consider only one incumbent). Since the incumbent knows the quality of the new entrant, he can react to high and low quality entrants differently. The incumbent in our framework gains from unmasking an entrant to be of low quality. This unmasking can work only if the entrant has no defence, e.g. if she cannot run a time-consuming and costly advertising campaign, or provide certification, whether costly or not. A low quality

[1] Recent analyses of vertical foreclosure focus on cases where an essential facility is involved (see for instance Rey and Tirole, 1998).

has no such defense at hand since by definition cannot provide unambiguous evidence of high quality (obviously, furthermore, cheating cannot occur at equilibrium). By contrast, having sunk the entry cost, a high quality entrant will defend herself through costly information transmission. Hence, an incumbent by enforcing the exclusivity clauses, only allows for separate dealing if the entrant is of low quality, whereas he waves the exclusivity rights and accepts to share the distribution network with a competitor of high quality. Note that since his brand image cannot suffer the incumbent bears no direct loss from sharing the distribution channel. Also, as we show, the entrant cannot free-ride on the brand image in case exclusive dealing is prohibited. From the incumbent's point of view it is not the protection of his brand image but the indirect payment obtained from the entrant which motivates him abandoning exclusive dealing clauses. Furthermore, the signaling is an outcome of belief formation by rational consumers who are able to interpret the strategy of the incumbent. This suggests that the signaling mechanism which works with exclusive dealing unveils one of a more basic nature, namely that the incumbent's reaction to entry may transmit information about the entrant's characteristics.

The assumption that an entrant's quality may not be known to consumers is not new (Farrell, 1986) and seems natural for many markets. The assumption that the incumbent is perfectly informed about the competitor's quality while consumers are not is certainly admissible for a wide range of cases. It is indeed true for many markets that the single consumer should afford a disproportionately high cost to gain information about the entrant while the firms in the business, thanks to their knowledge of the technology or to the network of experts to which they have access, can easily compare their own product with the entrant's.

Firms sell through retailers. Retailers are assumed to be small and have no market power, neither in the pricing nor in the selection of the brands. This means that we look at vertically related markets in which the downstream firms have no buying power.[2] Clearly, since retailers only affect prices due to their costs we can neglect the pricing decision of the retailers with great simplification of the analysis. In Section 2, we lay down the model of

[2]This market structure is often adopted for retailing and follows the Chicago school thinking. E.g. Ornstein (1989, p. 91) states that in most cases retailers operate in competitive markets. When retailing markets are not perfectly competitive, in particular when there are significant barriers of entry to retailing our analysis would need to be modified.

entry and show the main results under moral hazard.

In Section 3 we discuss the results. We show that they hold as well under adverse selection, where exclusion is enforced if Nature has selected the bad quality product for the entrant. Then we argue that exclusionary practices play a similar role as membership refusal when used by producers associations that do not automatically grant membership to applicants but select based on quality. Alternatively the physical location where to sell can play such a role if access can be directly or indirectly controlled by established firms.

We then briefly show that comparative advertising can be viewed under the same light as exclusionary practices in so far as the decision to run a costly campaign against an entrant may depend upon the quality of the entrant. No comparative advertising is used against high quality entrants so that these can save upon their own signaling costs. Prohibition of comparative advertising would close this information channel. Then, we point out that an incumbent can engage in a price war against a low quality entrant with the same signaling effect.

Finally, we discuss the possibility of commitment to exclusionary practices as a way to foreclose the market against entrants of any quality. We argue that commitment to exclusionary contractual restraints can possibly be obtained through certain kinds of investments. Also the admission rules of associations might make commitment feasible.

Section 4 concludes. Appendix 1 gives some details about the mixed strategy equilibria and Kohlberg-Mertens stability. Appendix 2 discusses pooling equilibria under adverse selection.

2 Exclusionary practices and market entry

2.1 An entry game with moral hazard

We analyze a model of entry into a product market in which manufacturers have to sell their products via retailers. A potential entrant has to pay a sunk cost e when entering the market. At the same time the entrant has to decide upon the product quality. For simplicity, we assume that the sunk cost e is independent of the product quality. The single incumbent I has already sunk this cost and is known to be of high quality. Before selling their products manufacturers have to decide upon their distribution channel.

The retailing sector resembles perfect competition because retailers are

pure Bertrand competitors. Retailers have a fixed cost and a variable cost which is assumed to be linear in the quantities of the goods they sell. In addition, retailers have to pay to the manufacturers for the products. We consider two-part tariffs which are set by the manufacturers. Retailers take this price schedule as given. Since there are no sunk entry costs into retailing retailers can always enter and maximize profits subject to a nonnegative profit condition. Profits of a typical retailer are $\pi_R = \sum_i((p_i^R - p_i - c_i^R)x_i + t_i) - f^R$ where f^R is the fixed cost of retailing, c_i^R are the product specific constant marginal costs of the retailer and p_i and t_i are the elements of the two-part tariff of manufacturer i. To keep the analysis simple the fixed cost of retailing is independent of the number of goods sold through the retailer. This is a particular assumption of economies-of-scope. The main message of this section on the use of shared retailers under asymmetric information and the role of exclusive dealing clauses does not depend on the assumption of economies-of-scope (see below). Assuming pure Bertrand competition the retailing sector is perfectly competitive and the retailing prices are $p_i^R = p_i + c_i^R$. In order for the retailer to make profits $f^R - \sum t_i \leq 0$. Retailers receive no share of the profits because they have no bargaining power. This holds if the manufacturers can change retailers at no cost.[3] If there is only one manufacturer this manufacturer will set the transfer equal to f^R and set p_i such that it maximizes monopoly profits taking the added costs of retailing into account. In the case of two manufacturers the sum of transfers equals the fixed cost of manufacturing.

We assume that under shared retailing manufacturers share the total fixed cost of retailing $f \equiv \sum f^R$ such that the incumbent pays less than in the case of the exclusive use of the retailers. For simplicity, we assume that in the case of shared retailing the entrant pays f as a fixed payment to the retailers. Under this assumption the entrant does not have a cost advantage when using the retailer network of the incumbent. As it shall become clear, our arguments do not depend on a particular sharing rule nor on the assumption that the entrant cannot make explicit side-payments to the incumbent.

Under perfect information the manufacturers' profits gross of fixed costs depend only on the quality of the competitor. The produced quality coin-

[3]If there is a cost of changing retailer then the retailers can obtain a share of profits. However, due to pure Bertrand competition among retailers this does not affect the pricing decisions but only the fixed transfers t_i. Our results hold for the costs of changing the retailers are not too large.

cides with the perceived quality and we write $\pi_I(q_E)$ for the profits of the incumbent and $\pi_E(q_E)$ for the profits of the entrant. To simplify matters the entrant can either choose low or high quality if she enters; i.e. $q_E \in \{L, H\}$. If the entrant does not enter the incumbent makes monopoly profits.

We analyze the following game played by an entrant, an incumbent, and by consumers. The incumbent has already signed, before the game starts, a dealing contract with the retailer. If exclusive dealing clauses are allowed the contract contains such a clause; if they are forbidden, the contract does not contain it.

Stage 1: The entrant moves and chooses whether: a) enter with high quality, b) enter with low quality, c) stay out of the market (entry and technology decision). In case c) the game ends and the incumbent remains a monopolist. In case of entry the entrant chooses quality q_E which is common knowledge between incumbent and entrant but not observed by the consumers. The entrant pays entry cost e.

Stage 2: If the entrant is in, she first decides whether to apply to the incumbent's retailer network and then the incumbent chooses between allowing or not the entrant to share the retailing network—namely whether to enforce or not the exclusionary clause that is attached to the contract linking incumbent and retailer. In case of shared retailing the entrant pays f and otherwise each manufacturer pays f.

Stage 3: the entrant decides whether to continue in the market and whether to certify her product quality. In case of certification she incurs costs g.

Stage 4: the manufacturers set the wholesale price of their product and retailers set prices in the final product market taking wholesale prices as given. Manufacturers pay the respective production costs which are d more for high instead of low quality.

Stage 5: consumers observe the entry decision, prices, certification decisions and retailing arrangements and use this information to form their beliefs on the product quality of the entrant. Based on their beliefs they make their purchasing decision.

At a later point we will allow the entrant to randomize between qualities at stage 1 and the incumbent will be allowed to apply the exclusive dealing clause with any probability at stage 2. We do not formally introduce the possibility of random certification but our qualitative results will remain unaffected. In our simple model the entrant always wants to access the retailer network of the incumbent and therefore the first part of stage 2 is

not considered.

As it will become clear, under our assumptions stage 4 is black-boxed in the profit functions since prices depend only upon whether entry has occurred or not and upon the perceived quality of the entrant. We comment on price signaling by the incumbent in the next section.[4]

We look for perfect Bayesian equilibria (PBE) where we only need subgame perfection so that it is equivalent to consider subgame perfect Bayesian equilibria.

Consider the case of perfect information where, unlike the case of the five stage game, also consumers observe the quality choice of the entrant. This means that in this case stage 3 is irrelevant and at stage 5 consumers are perfectly informed.

At the subgame after stage 4, manufacturers choose prices noncooperatively and take the marginal costs of retailing into account. We do not impose a particular model of price competition, nor symmetry assumptions and only make assumptions on reduced profit functions.

- A.1 $\pi_I(L) > \pi_I(H)$ and $\pi_E(H) > \pi_E(L)$

The first part of the assumption reads that the incumbent prefers to compete against low quality. This means that she enjoys more market power competing against low quality. The second part reads that the entrant prefers to be of high quality, a property which is not met by models of pure vertical product differentiation and price competition. The assumption means that as a high quality firm can extend its demand and/or increase price-cost margins. It is met in many oligopoly models (see Garella and Peitz, 1999).

We further assume that under perfect information a high quality entrant makes positive profits.

- A.2 $\pi_E(H) - e - f > 0$

A.2 implies that under perfect information entry will always occur. Clearly, under A.1 and A.2 the potential entrant enters and chooses high quality at

[4] Concerning the possible role of prices or other variables as signals used by the entrant, they cannot play a role in our simple model. In an extended model one would need to show that certification is a cheaper way for the entrant to reveal quality than other signals.

stage 1. At stage 2 the entrant joins the retailer network.[5] In subgame perfect equilibrium profits are $\pi_I(H)$ and $\pi_E(H) - e - f$. The incumbent has no incentive to exclude the entrant from her retailer network. Thus in this setup exclusive dealing clauses are not used under perfect information and therefore arguments in favor or against exclusive dealing which are not due to asymmetric information have been successfully excluded from our model.

Now we introduce *asymmetric information*. For the purpose of exposition we first analyze the 5-stage game under the restriction that the incumbent is forbidden to apply any exclusionary restriction. The entrant of course can decide whether to join or to sell through a different retailer network.

The cost of quality can be thought of as fixed or variable, the choice has no consequence for the analysis as far as it is maintained that manufacturers are committed to their quality. The cost difference between producing high and low quality for the entrant $d > 0$ is paid at stage 4.[6]

In our model the incentives for the manufacturers are straightforward. A low quality entrant which is believed to be of high quality makes profits $\pi_E(H) + d - e - f$ whereas a high quality entrant which is believed to be of high quality makes profits $\pi_E(H) - e - f$. The entrant can thus increase her profits by d if she can cheat on quality. A high quality entrant wants to be believed to be of high quality because in this case she gains $\pi_E(H) - e - f$ compared to $\pi_E(L) - d - e - f$.

Moral hazard leads to no entry if $\pi_E(L) - e - f < 0$, and it leads to entry with low quality if $\pi_E(L) - e - f \geq 0$.

When certification is available, at stage 3 the high quality entrant has the mean of perfectly revealing her quality, albeit at a cost. Certification can be interpreted as certification by an outside auditor (Biglaiser, 1993), warranties, or the entrant's advertising. The addition of this cost to the entry cost may make it unprofitable to enter the market.

In case of entry consumers have to form beliefs based on the observation of the prevailing distributional arrangements and whether or not the entrant

[5] Under our assumptions the entrant is indifferent whether to join the incumbent's retailer network. Since there are gains from shared retailing the entrant should always join the retailer and pay a share of the fixed cost λf, $\lambda \in [0, 1]$.

[6] The cost could also be modeled as a sunk cost which the entrant incurs when it chooses quality, which implies that manufacturers do not have an incentive to downgrade high quality after entry because it does not give a cost advantage. This alternative specification, which we do not adopt however, would need the definition of entry costs e_H and e_L, one for each quality.

has certified. There are two events concerning certification and two concerning the distribution arrangement. This makes up for four possible observations: certification and shared retailing denoted by $(C, 2)$, no certification and shared retailing $(N, 2)$, certification and separate retailing denoted by $(C, 1)$, and no certification and separate retailing $(N, 1)$. To keep the analysis simple at this point, consumers either believe the brand is of high quality with probability 1 or 0. Hence beliefs of consumers are a map from $\{C, N\}$ times $\{1, 2\}$ to $\{L, H\}$ and we write e.g. $b(C, 1) = H$ for the belief that the entrant produces high quality if she certifies and chooses separate retailing.

Since only a high quality firm possibly certifies consumers have to believe that $b(C, 1) = H$ and $b(C, 2) = H$. The only degree of freedom on beliefs is whether a particular retailing arrangement is believed to reveal high quality in absence of certification.

We analyze markets in which the cost of certification is high, so that entry with certification is not profitable:

- A.3 $\pi_E(H) - e - f - g < 0$

If certification was cheap enough, then the moral hazard problem could be directly solved and the only possible role of the retailing arrangement is to save the certification cost. An entrant would enter with high quality and sell through the incumbent's retailer if $\pi_E(H) - e - f - g \geq 0$. However, if certification is costly so as to respect A.3 above, then it is easy to prove the following.

Proposition 1 *If exclusive dealing clauses are not allowed, the potential entrant does not enter the market if* $\pi_E(L) - e - f < 0$. *The potential entrant enters with low quality if* $\pi_E(L) - e - f \geq 0$.

In the game where the incumbent cannot use exclusive dealing clauses only the entrant can provide information to the consumers. The entrant cannot signal high quality without using certification because there is the fixed gain from cheating d independent of the retailing arrangement. Proposition 1 characterizes all PBE when exclusive dealing clauses are not available.

2.2 The signaling role of exclusion

The present subsection gives precise content to the idea that exclusivity clauses help solving the moral hazard problem by signaling through a com-

petitor.[7] First, let us strengthen part of A.1 to

- A.4 $\pi_I(L) - \pi_I(H) > f$

This implies that the possible savings from sharing the fixed costs with the entrant are lower than the gains from unmasking that the latter is of low quality.[8]

Although entry with separate dealership is not profitable we assume that once the entry costs are sunk it is worthwhile for a high-quality entrant not to leave the market.

- A.5 $\pi_E(H) - f - g > 0$.

Hence, the participation constraint of a high-quality entrant is not binding in the subgame starting at stage 3 independent of the previous action of the incumbent.

Then consider the two possible cases: either $\pi_E(H) - g > \pi_E(L) - d$ or the opposite inequality. We assume the first case,

- A.6 $\pi_E(H) - \pi_E(L) > g - d$.

Under A.6 the entrant of high quality has an incentive to reveal its quality in spite of the certification costs. If the inequality in A.6 is reversed, the high quality firm prefers to be perceived to be of low quality rather than to certify. This case is of no interest because quality certification violates the incentive constraint at stage 3 and thus does not provide a defense for the high-quality entrant.

We return to consumers' beliefs. Recall that $b(C, \cdot) = H$, i.e. independent of the retailing structure certification C perfectly reveals high quality. The beliefs for the observations $(N, 1)$ and $(N, 2)$, where 1 stands for separate retailing and 2 for multi-brand retailing can give any probability to H. In

[7] Somewhat related literature studies the possibility of brand signaling in the case of a multi-product firm (Wernerfelt, 1988; Cabral, 1998; Choi, 1998; Tadelis, 1999) and in the case of vertically related firms (Chu and Chu, 1994; Biglaiser and Friedman, 1994). There are two important differences between that and our work: first, in our model there is no reputational loss for the incumbent whereas reputation losses are important for the cited works. Second, the incumbent's action and not his reputation is the key to our results.

[8] If joint retailing costs were $2f$ instead of f, namely without scope economies, then it would be sufficient to assume that $\pi_I(L) - \pi_I(H) > g$. Incumbent and entrant would bargain over the gain to be split between them.

this subsection we focus on PBE with beliefs which attach either probability 0 or probability 1 to H. Note that any belief system containing the belief that separate retailing is associated to a high quality entrant cannot be part of an equilibrium system of beliefs. Under such a belief system, indeed, the entrant would choose the low quality at the first stage and enjoy the profits of a high quality without certification. But then the beliefs would be violated. It follows that all rational 0,1-beliefs necessarily entail

$$b(N,1) = L.$$

The complete belief system then is obtained by spelling out that either $b(N,2) = L$ or $b(N,2) = H$.

Definition 1. *Beliefs-A:* $b(N,2) = L$.

Then, under beliefs -A and under the assumptions above, a high quality entrant obtains profits

$$\pi_E(L) - d - e - f$$

if she does not certify, and

$$\pi_E(H) - g - e - f$$

if she certifies. This is irrespective of the retailing agreement that prevails after entry. Then, under this belief system, no saving on certification costs is possible and entry of high quality does not occur. If $\pi_E(L) - e - f < 0$ this belief system sustains an equilibrium path at a PBE along which the incumbent remains a monopolist.

Definition 2. *Beliefs-B:* $b(N,2) = H$.

Under these beliefs the moral hazard problem can be solved. It is the incumbent's threat of exclusion from the distribution channel which convinces consumers of the high quality of the entrant.

Proposition 2 *If exclusivity clauses are legal, there exists a PBE where the entrant chooses the high quality, enters, shares the retailing structure with the incumbent. This equilibrium entails the credible threat to keep exclusivity clauses enforced against a low quality entrant. If exclusivity clauses are illegal then these equilibria are destroyed.*

Proof. Under beliefs-B the entrant wants to sell through the retailer network whether her true quality be H or L. However, in case of entry with quality H, if exclusivity clauses are applied the H entrant certifies. Recall indeed that by certifying the entrant obtains $\pi_E(H) - g$ instead of $\pi(L) - d$ (see A.6). Therefore, enforcement of the exclusivity clause only gives $\pi_I(H) - f$ to the incumbent. By contrast, if the incumbent accommodates the entrant and shares the retailers then he gets $\pi_I(H)$ which is obviously a preferable choice. Then this means that a high quality entrant can count upon being accommodated in the retailing structure and save the certification costs g. Also, one can check easily that the incumbent will not accommodate a low quality entrant, because the payoff for the incumbent is $\pi_I(L) - f$ instead of $\pi_I(H)$ under common representation—recall that by A.4 $\pi_I(L) - f < \pi_I(H)$. Accordingly, consumers' beliefs are confirmed at an equilibrium with beliefs B. Indeed, out of the equilibrium path if the entrant is L, the incumbent has an incentive to enforce the exclusivity clauses and to force the entrant to independent retailing. ■

The incumbent reacting differently to the high and low quality firm is the key to the belief system with $b(N, 2) = H$ which allows saving of the certification costs for the high quality entrant. The above proposition is the main result of the analysis. It implies that a prohibition of exclusivity clauses under moral hazard can only prevent the attainment of socially desirable outcomes.

Our result focuses on entry and the solution to the moral hazard problem. Denoting by W^+ social welfare under monopoly and by $W(q_E)$ welfare with entry of quality q_E, entry with high quality is unambiguously welfare enhancing if $W(H) > W^+$ and $W(H) > W(L)$. When considering moral hazard as a problem from the social point of view these inequalities are satisfied.

2.3 Equilibrium outcomes, stability and extensions

For a complete characterization of all PBE of the game one needs to introduce mixed strategies. We concentrate first on the more interesting case where both $\pi_E(L) - e - f < 0$ and $\pi_E(H) - e - f - g < 0$, i.e. on the case where neither a low nor a certifying high quality entrant can make profits when entering the market (the latter inequality is A.3). Here there are two types of PBE in pure strategies. The first class sustains *outcome-a*: No entry occurs. The second class of equilibria sustain *outcome-b*: entry occurs only with the high quality, and the incumbent does not enforce the exclusivity clauses against the high

quality. In addition to the two classes of PBE in pure strategies there may exist a PBE in mixed strategies in which the entrant enters and chooses L with a particular positive probability, γ, and in which the incumbent lets the low quality entrant share retailing with positive probability, ϕ, while it waves the clause with probability one against an entrant of high quality (see appendix 1). The set of PBE in mixed strategies in which the entrant enters with probability 1 is either a singleton or empty. It cannot contain more than one element because the belief that a firm is of high quality is uniquely determined, and so are the mixed strategies of the two firms. In part 1 of appendix 1 we characterize the candidate mixed strategy equilibrium in the case that reduced profit functions are linear in expected quality of the entrant. We give conditions for this candidate to be an equilibrium. If the condition that expected profits from entry are nonnegative fails then an equilibrium in mixed strategies does not exist.

An equilibrium which resists the application of the stability criterion by Kohlberg and Mertens (1986) is called *KM stable*.

Proposition 3 *Generically, the set of PBE in pure strategies which supports the outcome with no entry is not KM stable.*

The proof is delegated to part 2 of appendix 1.

This means that, since a stable set always exists, if the profitability condition for the candidate of a mixed strategy equilibrium is violated, the unique stable set is that of pure strategies equilibria sustaining outcome-b. If the profitability condition is strictly met, then also the mixed strategy equilibrium constitutes a stable set. Note that in both cases the exclusive dealing clauses play a key role in determining the possibility of entry. Both types of equilibria are destroyed if exclusivity clauses are not allowed.

So far we concentrated on the effect of exclusive dealing clauses in a market environment in which low quality firms have no incentive to enter. If $\pi_E(L) - e - f \geq 0$ a low quality entrant has an incentive to enter the market. Then there exist two classes of equilibria in pure strategies: those sustaining outcome-b as defined above, and those sustaining the outcome, in which the entrant enters with low quality and the incumbent waves the exclusive dealing clause because $b(N, 2) = 0$ and since we assumed that there are economies of scope in retailing. If consumers believe in the signaling role of shared dealing, namely $b(N, 2) = 1$, the moral hazard problem is solved (outcome-b).

3 Discussion and examples

The basic principle that an action which apparently hurts a competitor may not hurt competition is at the root of many defenses of business practices. The specific form that this principle takes in our analysis is that an action can reveal information about the type of the competitor. In particular, the application of exclusive dealing in retailing can be done selectively against rivals of low quality. Therefore, when the action is not taken it reveals good information about the entrant's quality. For the signaling mechanism to work, however, the alternatives to take or not the action must both be available. Prohibition of the specific action considered by law or per se illegality would eliminate this signaling mechanism and increase entry costs.

- *Adverse selection:* We obtained our results in an environment of moral hazard. They similarly hold under adverse selection with exogenously given qualities of an entrant. If correctly perceived low quality cannot survive in the market, i.e., $\pi_E(L) - e - f < 0$, there exist three classes of PBE: no entry, entry of only the high-quality potential entrant, and pooling equilibria in which both types enter and share the retailing network with the incumbent. Depending on the parameters of the model (and Nature's probability distribution of types) the set of pooling equilibria is possibly empty (see appendix 2). If there are no pooling equilibria we can apply a forward induction argument similar to the intuitive criterion in order to select the set of PBE in which only the potential entrant of high quality enters. When on the contrary also correctly perceived low quality can survive in the market, i.e., $\pi_E(L) - e - f \geq 0$, entry of low quality always occurs. We obtain the signaling role of the exclusionary clause when consumers recognize the informational role of shared retailing so that the incumbent waves the exclusive dealing clause if Nature has chosen H and enforces it if Nature has chosen L. In such a market exclusive dealing clauses are observed and the clause screens between high and low quality entrants. If exclusive dealing clauses are prohibited, there is no entry, only entry of low quality, or pooling.

- *Boycotts and refusals to deal:* Exclusionary practices like boycotts or refusals to deal would fall much under the same category of action as exclusive dealing in retailing, provided they are based upon quality of the target. An illustration may be found in the health insurance

market in the U.S., where PPO's can be seen as contractual organizations that select a group of providers of health services among all those which are potentially available. Excluded providers could appeal against exclusion by invoking the boycott or refusal to deal. A defense of PPO's against such lawsuits is that participation to the group is granted according to quality standards (Youle and Dow, 1984). Similarly, hospitals have the right to refuse access to providers of services.[9] Membership to associations of producers sometimes also performs a role of quality signaling and refused members can file against refusal decisions by the associations. However, the association is not guilty of hurting competition if it bases refusal on quality standards. To the contrary, the existence of the association creates an incentive to avoid the moral hazard trap for producers who want to enter the market. The reputation of its members is lent to newcomers of the association. For example, agricultural cooperatives which are engaged in sales and marketing might need an exclusion mechanism to defend their reputation. Following our model, they are also interested in sharing expenses and do not obtain a competitive advantage from exclusion in the case of a "good" entrant, whereas they would do so in the case of a low-quality entrant. This seems likely if sales are local so that the effects of strategic interaction are strong.[10]

In the case Fashion Originators' Guild of America, Inc. vs. Federal Trade Commission, 1941 women's garment manufacturers organized in the Guild claimed to protect themselves from so-called style pirates by refusing to sell to retailers who also sold garments from manufacturers outside the Guild.[11] As discussed by Bork (1978, p. 339) "the insistence of the group that copies (i.e. competing products from outside the Guild; the authors) not be sold by their retailers ... may be nothing more than an attempt to gain the efficiencies of advertising and pro-

[9] The Federal Trade Commission has recognized that "in some circumstances, contracts where a hospital grants a single firm the exclusive right to perform a particular medical service (e.g. anesthesia) at the hospital can be procompetitive" (Lerner, 1984, p. 213).

[10] For a historical example of cooperatives in which asymmetric information plays an important role, see Henriksen (1999).

[11] The Supreme Court saw the boycott as an attempt to suppress competition and ruled that it violated the Sherman Act and was an "unfair method of competition" proscribed by the Federal Trade Commission Act. The worries of the Court may have been that membership was not open to manufacturers which were not style pirates. However, the Court rejected to hear evidence from the Guild and did not consider this issue.

motion that lead to exclusive dealing in many industries". The boycott possibly was used as a signaling device which protected the Guild from sharing their retailers with free-riders. Apart from the signaling interpretation the Guild members also tried to protect their design from copying. (Professional associations to some extent are also involved in the same exclusionary practices.)

- *A place to sell:* The establishment of shopping malls and trade centers where sellers must apply for the right to install their facilities can also induce a selection mechanism of a kind similar to those just mentioned. Again, the idea is that the refusal or acceptance option for a particular seller in a shopping center can work as a signal. This relies on sellers, for instance for clothing, to be in direct competition with each other. Side payments can be implicit in the different rental agreements with low rents for well-established, highly reputed brands whose reputation improves the perception of the shopping mall or trade center in general.

- *Comparative advertising:* An example of an action which is outside the field of exclusionary practices is represented by comparative advertising. Whether advertising is or is not comparative is clearly an observable action which is of the zero-one type. Comparative advertising is then used by the incumbent to unmask a low quality entrant. To see this we reformulate the five stage game analyzed in section 2 so as to describe an entry game where the incumbent knows the quality of the entrant better than the consumers. The incumbent can inflict a loss equal to f_L (that can eventually be zero) to the low quality entrant by running a comparative advertising campaign costing f_I. A high quality entrant can avoid being mistaken as low quality by offering full warranty at a cost g. The incumbent will not spend f_I against a high quality entrant if this will not raise its current profits, i.e. unless this can really induce mistaken consumers' perceptions of the entrant's quality. Again, under assumptions similar to A.1–A.6 about the firms' profits, the high quality prefers to defend itself rather than being mistaken as low quality. But then the incumbent will not use advertising, which is costly, against a high quality entrant. This, however, alerts consumers that the entrant is indeed high quality and the latter can

avoid the revelation cost g.[12]

- *Price reactions to entry:* Another possibility is price signaling by the incumbent. The incumbent can unmask a low quality competitor by lowering price, and if this gives him higher profits than in the duopoly where the entrant is perceived to be of high quality, the threat of a price war by the incumbent is credible. This can sustain an equilibrium where consumers hold beliefs such that the incumbent's low price can be a signal of the entrant's low quality.[13] Note that a price reduction below prices under perfect information inflicts a direct loss due to intensified competition and an indirect loss due to the unmasking on a low quality entrant. Since the price reduction can be varied, the direct loss is endogenously determined. In our model of retailing, the entrant does not suffer a direct loss if the exclusive dealing clause is enforced, and, in a more general setting, this loss would be exogenous. The endogeneity of the direct loss allows for information transmission even if the certification cost of the entrant is above the difference between profits a high quality entrant gets when perceived as such and the ones when masked as low quality using full information prices. This implies that a price reduction can signal product quality even if A.6 does not hold. Also, the endogeneity of the direct loss makes the threat of a price war potentially a more powerful weapon against low quality so that low quality is more easily eliminated. The applicability of a price war as a mean to avoid entry by low quality is however limited: a price reduction hurts also the incumbent so that a "large" price reduction will violate his incentive constraint.

- *Commitment:* Our argument that exclusionary practices and the use of comparative advertising are procompetitive is based on impossibility to commit to certain actions before entry has taken place. The actions of the incumbent have thus to be seen as reactions to entry. If the model is interpreted as one of comparative advertising this seems to be natural since comparative advertising only reacts to new entry. Also, we do not see a meaningful way for the incumbent to credibly commit not

[12] A related idea of advertising as a signal of product quality is analyzed in Matthews and Fertig (1990).

[13] The extensive game would need some modifications and the possibility and exact form of price signaling would depend on the particular underlying oligopoly model.

to use comparative advertising as a unilateral action by the incumbent. In the case of exclusionary practices the possibility of renegotiation is what allows the incumbent to react to entry. The exclusivity clause assigns a property right on reputation to the incumbent and allows a contractual arrangements between incumbent and entrant whereby the latter can pay a side payment to the former in order to use the retailing network.

It is conceivable, however, that the incumbent can gain commitment to apply exclusivity restraints irrespective of the entrant's quality. This would be possible through investments made at the retailer if the returns on these investments depend on the distribution arrangement, namely if they are less under shared retailing. Brand differentiation investments, like in life-style and luxury goods markets, are possibly of this kind. If investments can be made such that joint profits under shared retailing are less than under separate retailing, the possibility of foreclosure arises.

Apart from investment, commitment might result from procedural rules of an association concerning access. If such rules delay access they can effectively eliminate the interest to enter the market thus foreclosing the market.

4 Conclusions

In a game of entry under asymmetric information, where an incumbent has the power to adopt exclusionary practices, shared retailing reveals that the incumbent has not used exclusion. This is valuable information to the consumers. Due to the signaling role of exclusionary practices, competition is enhanced, i.e. a high quality competitor enters the market. Once entry has occurred, the incumbent has no interest to enforce exclusion against a high quality entrant, given that the latter will pay the cost to reveal her quality. This is an equilibrium strategy for the incumbent.

We do not question that firms can and do act with the intent of hurting their rivals—and that this can also apply to the adoption of exclusionary practices (Krattenmaker and Salop,1986, for instance, define a broad framework of interpretation of practices which hurt rivals). In the model, the threat to use exclusion against a low quality entrant is credible and such an entrant would indeed be hurt by the incumbent in this way. Nevertheless, thanks to

this threat, under moral hazard the entrant chooses high quality and enters instead of staying out or of entering with low quality. Under adverse selection, the low quality entrant cannot cheat consumers. She either stays out or, if she can enter, is obliged to separate retailing, while the high quality shares the retailer and saves the costs of certifying. Similar arguments apply to the freedom to engage in comparative advertising, or in price wars against the entrant. In this context, "hurting rivals may not hurt competition". Indeed, the possibility to adopt practices that hurt rivals, can lead incumbents to act so as to solve a problem of asymmetric information which weighs upon the entrant.

Appendices

Appendix 1: PBE in mixed strategies and stability

We consider consumer beliefs with $prob\{H|(N,2)\} \in (0,1)$. If $(N,2)$ obtains in PBE with positive probability, beliefs have to be confirmed. Hence, in any PBE with such beliefs the entrant must be indifferent between choosing H or L. Denote the probability that an entrant under multi-brand retailing who does not certify is of high quality by b, i.e. $b = prob\{H|(N,2)\}$. Since a high quality entrant always certifies when rejected by the incumbent, the incumbent always allows for multi-brand retailing when facing H.

In general, the profits of the firms depend on b in a way which may not be linear: π_I will not be a linear combination of $\pi_I(L)$ and $\pi_I(H)$. Similarly, π_E will not be a linear combination of $\pi_E(L)$ and $\pi_E(H)$. This said, the calculations for a mixed strategy equilibrium can always be done in specific examples where consumers' utility functions, the demand functions, and firms' costs are completely specified. In general there is no presumption that a mixed strategy equilibrium exists.

Part 1: Characterization of equilibrium in mixed strategies

We shall proceed under the simplifying assumption that expected profits are linear combination of the full information profits for both firms. This case only serves for illustrative purposes. When faced with L the incumbent's expected profits as a function of b are

$$E\pi_I = \phi\left(b\pi_I(H) + (1-b)\pi_I(L)\right) + (1-\phi)(\pi_I(L) - f)$$

where ϕ is the probability of accepting multi-brand retailing. At stage 2 the incumbent maximizes expected profits with respect to $\phi \in [0,1]$. For a PBE with above beliefs to exist, $\phi \in (0,1)$ because if $\phi = 0$, the entrant does not have an interest to produce L whereas if $\phi = 1$ the entrant does not have an interest in producing H. For ϕ to be in $(0,1)$, the incumbent must be indifferent between applying the exclusive dealing clause or not to L, i.e. $b\pi_I(H) + (1-b)\pi_I(L) = \pi_I(L) - f$. This equation uniquely determines b:

$$b = \frac{f}{\pi_I(L) - \pi_I(H)}$$

Note that A.4 implies that $b < 1$. At stage 1 the entrant has to choose quality. In order to confirm beliefs, the entrant must be indifferent between

H and L. If she chooses H her profits are

$$b\pi_E(H) + (1-b)\pi_E(L) - e - f - (1-b)d$$

because the exclusive dealing clause is not applied by the incumbent and with probability $1-b$ the entrant is wrongly perceived to be of low quality. Whereas if she chooses L she affords

$$\phi\left(b\pi_E(H) + bd + (1-b)\pi_E(L)\right) + (1-\phi)\pi_E(L) - e - f$$

For the entrant to be indifferent these two expressions must be equal. This reduces to

$$1 - \phi = \frac{d}{b}\frac{1}{d + \pi_E(H) - \pi_E(L)}.$$

Note that when $1 - \phi > 1$ the mixed strategy equilibrium does not exist because the incumbent applies the clause to a low quality entrant with probability equal to 1. This happens when $b < d/(d + \pi_E(H) - \pi_E(L))$ or, since $b = f/(\pi_I(L) - \pi_I(H))$,

$$\frac{f}{\pi_I(L) - \pi_I(H)} < \frac{d}{d + \pi_E(H) - \pi_E(L)}$$

A mixed strategy equilibrium exists in the linear specification if the entrant makes positive profits given the calculated probabilities, i.e. if

$$\frac{f}{\pi_I(L) - \pi_I(H)}\pi_E(H) + \left(1 - \frac{f}{\pi_I(L) - \pi_I(H)}\right)(\pi_E(L) - d) - e - f > 0.$$

Clearly, this inequality is violated if f is sufficiently small relative to $\pi_I(L) - \pi_I(H)$. Then no mixed strategy equilibrium exists.

In general, a candidate for a quasi-separating PBE has beliefs b and the strategy of the potential entrant at stage 1 is to choose L with probability $\gamma = (1-b)/(1-b+b\phi)$ and the strategy of the incumbent at stage 2 is to apply the exclusive dealing clause with probability $1 - \phi$.

Part 2: Stability – Proof of proposition 3

Let E_0 denote the set of all Bayesian equilibria sustaining the outcome with no entry.

(i) Assume first that *no-entry* is a strong best reply for the entrant given the opponent's strategies and the consumers' beliefs. Any equilibrium in E_0 must be formed by beliefs such that $b(N, 1) < 1$ to guarantee that an entrant

of low quality gets negative expected profits (indeed we know from A.2 that $\pi_E(H) - f - e > 0$, since under perfect information a high quality firm could enter, and a low quality entrant would get $\pi_E(H) - f - e + d > 0$ if one had $b(N, 1) = 1$). Let $\pi_E(b)$ denote this expected profit (if expected profits are linear combinations then $\pi_E(b) = b(\pi_E(H) - e - f) + (1 - b)(\pi_E(L) - e - f)$). Since no entry is a strong best reply of the entrant then for the system of belief under consideration strategy L is not a weak best reply.

A stable set contains all KM stable sets of the game obtained after deletion of any one strategy which is not weak best reply against the strategy profile adopted by the other players (Proposition 6 in Kohlberg and Mertens 1986). Then, consider the game G' which is the original game except for the deletion of L at the first stage. Clearly, the unique equilibrium set of this game is such that H is chosen at stage 1, the incumbent waves the exclusivity clause, and the consumers buy according to the belief that both qualities are H. The intersection between the set of equilibria of G' and E_0 is empty and therefore the set E_0 cannot contain the stable sets of G', so that it is not a stable set of the original game.
(ii) Assume now that *no-entry* is not a strong but a weak best reply at the equilibrium under consideration. Then for L to be a weak best reply one should have that the entrant be indifferent between *no-entry* and L (and H) in order for the considered equilibrium to belong to E_0. This means that the incumbent will randomize over the enforcement of the exclusivity clause against a low quality entrant. Hence we are back to our unique mixed strategy equilibrium, with the particular parameter constellation which gives zero expected profits for the entrant. Otherwise the *no-entry* choice cannot be an equilibrium strategy. Profits equal to zero in the mixed strategy equilibrium corresponds to a set of zero measure in the space of admissible parameter values. ■

- Remark. When a mixed strategy equilibrium exists and generates positive profits for the entrant the corresponding equilibrium set and the equilibrium set sustaining *no-entry* are disconnected. Only when a mixed strategy equilibrium exists and generates zero profits for the entrant the corresponding equilibrium set and the equilibrium set sustaining *no-entry* are connected. The equilibrium set sustaining outcome-b is always disconnected.

- Remark. Kohlberg and Mertens (1986) prove the existence of stable sets. Since the set of equilibria sustaining outcome-a (no-entry) is not

stable, then the stable set is the one containing all equilibria sustaining outcome-b if no other set of equilibria exist, namely if there is no mixed strategy equilibrium. When the mixed strategy equilibrium exists, we could not find any argument to prune it using KM stability.

Appendix 2: pooling equilibrium under adverse selection

Assuming linearity of π_I and π_E in expected qualities, in this appendix we provide the parameter restrictions as to when a pooling equilibrium exists. Nature chooses H with probability α at stage 1a. At stage 1b the potential entrant decides whether to enter. In a pooling equilibrium where both types of potential entrants enter and share the retailing network with the incumbent, posterior beliefs have to satisfy $prob(H|(N,2)) = \alpha$. We check that no firm has an incentive to deviate from the equilibrium strategy.

1) Participation constraint of H at stage 1b. This translates into

$$\alpha \geq \frac{d - (\pi_E(L) - e - f)}{\pi_E(H) - \pi_E(L) + d}$$

In the case $\pi_E(L) - e - f < 0$ this critical α is strictly positive. The participation constraint of L is then always satisfied. By A.2 the critical α is less than 1.

2) The incentive constraint for H at stage 3 not to certify translates into

$$\alpha \geq 1 - \frac{g}{\pi_E(H) - \pi_E(L) + d}$$

By A.1 and A.6, this critical α is between 0 and 1.

3) The incentive constraint for the incumbent to grant a low-quality entrant access to her distribution channel translates into

$$\alpha \leq \frac{f}{\pi_I(L) - \pi_I(H)}$$

By A.4 the critical α is strictly less than 1. Clearly, by combining the restrictions on α there exist parameter constellations such that pooling equilibria can be ruled out independent of Nature's probability distribution of types.

This argument in general in the sense that it does not depend on the particular distribution of retailing costs among firms. In the alternative model with bargaining among producers on the distribution of retailing costs $2f$ one of the two restrictions on α reads

$$\alpha \geq \frac{\pi_I(L) - \pi_I(H)}{\pi_E(H) - \pi_E(L) + d}$$

which is greater or equal to 1 if the competitive effect of higher quality perception on the incumbent's profits outweighs the effect on the entrant's profits.

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