EXCLUSIVE DEALING CLAUSES FACILITATE ENTRY*

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ABSTRACT

Firms willing to enter a market with a new product often face the problem that the market does not know its quality. Selling through a retailer might avoid excessive entry costs by renting the reputation of an incumbent. The incumbent can apply exclusive dealing clauses to his retailer. We show that the incumbent enforces the clause only against low quality entrants and that exclusive dealing clauses lead to a more fragmented industry and improve welfare. However, if the incumbent can undertake e.g. brand differentiating investments at the retailer (which are welfare enhancing under perfect information), the overall effect of exclusive dealing clauses may be welfare reducing under asymmetric information.

Keywords: retailing, vertical restraints, market entry, exclusive dealing, asymmetric information, antitrust

1   Introduction

Antitrust policy of the 90's on non-price vertical restraints is marked by a withdrawal of legalistic rules and guidelines. In the U.S. the vertical restraint guidelines have been withdrawn in 1993, and in Europe legislation is under reform (European Commission, 1997a,b, 1998). This makes more room for economic reasoning in antitrust.[1]

Non-price vertical restraints are particularly controversial in highly concentrated markets with substantial barriers of entry. For instance, policy in Europe is based on the belief that "anti-competitive effects are only likely where interbrand competition is weak and there are barriers of entry" (European Commission, 1997a, p. 26, see also Dobson and Waterson, 1996). Firms operating in such markets would benefit from restricting entry because this increases their power over price.[2] 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.

The pros and cons of non-price vertical restraints such as exclusive dealing, tie-ins and boycotts are well known. According to the thinking which is associated to the Chicago Law School, vertical restraints are largely explained by efficiency enhancing motives—for instance based on the idea that free-riding on investments at the retailer can be avoided through the use of restraints—while they do not serve to extend market power from one market to another (see e.g. Posner, 1976, Bork, 1978). It also appears that these efficiency arguments are widely accepted in the literature. However, the potential anti-competitive effects of non-price vertical restraints and vertical

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[1]There is a long history of antitrust cases related to vertical restraints. Among the famous cases in which the Court ruled against non-price vertical restraints are *Standard Fashion, Standard Stations, Brown Shoe, United Shoe Machinery.* However, as argued by Krattenmaker and Salop (1986) many of the Supreme Court's decisions were guided by inappropriate reasoning. After drastic changes in U.S. antitrust with respect to non-price vertical restraints over time there appears to be a consensus in most countries including Europe and the U.S. to base decisions on economic analysis rather than on inflexible rules and to weigh efficiency effects against anti-competitive effects. However, there remain some differences between the U.S. and the European Union in the 90's (see e.g. Pitofsky, 1997).

[2]In response to the Green Paper on Vertical Restraints (European Commission, 1997a) foreclosure is seen as the main problem of vertical restraints (see European Commission, 1997b, p. 7).

integration are taken up in recent work (e.g. Aghion and Bolton, 1987, Ordover, Saloner and Salop, 1990, Rasmusen, Ramseyer, and Wiley, 1991, Bernheim and Whinston, 1998, see also Comanor and Frech, 1985, Mathewson and Winter, 1987, Schwartz, 1987). These works warn against the collusive potential of vertical restraints and the possibility of foreclosing competitors by raising rivals' costs. In accordance with this literature, the net effect of vertical restraints has to be carefully checked in problematic cases depending on the particularities of the case.

The present paper adds to the theoretical analysis of non-price vertical restraints and stresses that these restraints may facilitate entry and thus be pro-competitive. This result abstracts from their efficiency enhancing effects. The main argument does not rely on higher short-term profits of the established firms in an industry (these higher profits may be caused by greater efficiency or by collusion) but on the signaling potential of the distribution arrangement in markets with asymmetric information. Focusing on market environments in which foreclosure cannot occur under perfect consumer information we follow the Chicago tradition and thus abstract from the antitrust concerns raised in the literature above (see also Rey and Caballero-Sanz, 1996). In our benchmark model with perfect information exclusive dealing clauses are not applied because there are no gains from doing so. In the presence of asymmetric information about the entrant product quality the present paper affords a formal treatment as to when exclusive dealing clauses are *pro-competitive*. Asymmetric information seems to be relevant in consumer good markets where goods are complex or change rapidly (relative to the purchasing frequency of consumers) so that consumers only imperfectly know the characteristics of the goods at the moment of purchase.

One of the arguments in favor of exclusive dealing clauses is that the possibility to exclude competitors from a distribution channel provides a means to protect the manufacturer(s') brand image or quality recognition from free-riding by other firms (see Bork, 1978). This idea has been discussed informally in various places in the specialized antitrust literature (e.g. Ornstein, 1989) and it seems relevant in the evaluation of several well-known antitrust cases.[3] Similarly, exclusive dealing protects the manufacturer's property rights on product design when competitors could otherwise free-ride by

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[3] For instance, Krattenmaker and Salop (1986) suggest that it played a role in General Electric refusal to deal with Klor, a retailing firm. See also *Fashion Originators' Guild of America, Inc. v. Federal Trade Commission, 1941*, below.

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supplying imitations to the same retailers (see Marvel, 1982). Furthermore the observation that clothing companies, producers of accessories, porcelain, sports goods, insurance companies, etc. have established own retail outlets (or franchised ones) seems to suggest that exclusive manufacturer-dealer relationships are of particular importance in the case of branded consumer goods.[4]

One can argue that exclusive dealing protects the brand image of an incumbent if, under imperfect information, consumers associate the retailer with the brands it sells, so that established brands, if they accept common retailing, are exposed to free-riding on reputation by non-established ones.

In general, imperfect information about the quality of the good is a disadvantage to a potential entrant (see Farrell, 1986). However, the analysis provided below recognizes that while facing an incumbent hurts the entrant for it creates competition, on the other hand it opens up some signaling possibilities. Consumers may infer the quality of the new entrant from the incumbent's reactions to entry, in particular, whether the incumbent enforces or not exclusivity clauses preventing the retailers from selling the entrant's product. It follows that common retailing helps the new entrant in conveying information to the consumers. As it results from the analysis, if common retailing is interpreted as a signal that the entrant is of high quality (a claim which sustains the free-riding hypothesis), then the freedom to use exclusionary clauses works in favor of solving the moral hazard problem for an entrant. Therefore their prohibition indeed makes entry more difficult: under a prohibition of exclusive dealing clauses common retailing prevails in all cases and it conveys no signal. The clauses reduce information costs so that they induce more entry and accordingly they lead to a more fragmented industry and lower profit margins of the firms.

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 (and has thus superior information compared to the consumers), he will react to high and low quality entrants differently. The incumbent gains from unmasking an entrant to be of low quality. This he can only do if the entrant has no defence against this behavior e.g. by

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[4]Many of these companies in addition sell through independent retailers. We believe that retailers such as discounters and department stores do not carry a signal for the consumers because in these stores brands of known high quality are sold together with brands of known low quality and thus this does not contradict our argument. Our focus is the choice among specialized multi-brand retailers and exclusive retailers.

running a time-consuming and costly advertising campaign, or by expensive certification. A low quality has no such defense at hand. 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.

In our simple model the incumbent reduces his payment to cover the costs of retailing when sharing his retailer network. In the real world this can imply that the new brands accept to pay a higher fee to the retailer, or get lower margins than the established brands, or be price discriminated unfavorably, or accept to provide some investment with positive externalities to the incumbent. Without such kind of conditions which can involve several dimensions the incumbent would not wave the clause as he would be hurt by doing so. We would argue that the critical element of our model is that the established manufacturer selects between good and bad entrants.

This makes it necessary that exclusive dealing clauses can be renegotiated after entry has taken place if this is to the mutual advantage of both contract holders also after entry has occurred—by definition, a contract is renegotiation-proof only if at least one party is hurt by it being renegotiated. However, if they are not renegotiation-proof the clauses by themselves have no commitment value and only represent an empty threat against a high quality entrant.

Our argument in favor of exclusive dealing breaks down if commitment can be gained. Indeed if the incumbent can sink, in the retailing relationship, costly investments which are only effective under an exclusive distribution channel, he can precommit to exclusive dealing irrespective of the entrant's type. Examples are franchising arrangements in which a brand is associated with characteristics of a retailer such as services and shop design which would be lost under shared retailing. In this case incumbents can obtain foreclosure through the sunk investment in combination with exclusive dealing.

Alternatively, the investments at the retailer may be of a public good nature as has been argued by the literature which is in favor of the legality of

exclusive dealing.(see Marvel, 1982, and Besanko and Perry, 1993). Services are tied-in to the product via exclusive dealing. Otherwise, other producers at the same retailer could *ex-post* free-ride which would make the investment in services unprofitable. Exclusive dealing allows the incumbent to be paid for the benefits he provides to the entrant. This is a different reason why exclusive dealing can be waved.

A particular antitrust case serves well to illustrate the sort of reasoning we have in mind. 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. 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. 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 promotion that lead to exclusive dealing in many industries". Although it remains unclear as to which explanation of the Guild's behavior is the appropriate, our analysis of asymmetric information suggests that it is not the exclusionary rule but rather whether the Guild committed to this exclusionary rule not discriminating between different types of (potential) competitors which may be anti-competitive. In the absence of such behavior the boycott possibly was used as a signaling device which protected the Guild from sharing their retailers with free-riders and thus would be pro-competitive in that it provides incentives to enter with high quality. By allowing for open membership tied only to some conduct such as quality standards the boycott should have been seen as pro-competitive.[5]

The plan of the paper is as follows. In section 2 we shortly present the benchmark case without retailing. In order to keep the analysis simple

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[5] The worries of the Court may have been that membership was not open to manufacturers which were not style pirates. If the Court's decision was based on this worry, it would be in line with the guidance offered in the conclusion below because the Guild's boycott would not satisfy their condition (2). However, the Court rejected to hear evidence from the Guild and did not consider this issue. Apart from the signaling device the boycott can be understood as a mean to protect the investment in design while manufacturers could not protect them as copyright. Along this line the same economic reasoning applies to the boycott as to a patent.

we present a market with one incumbent and one potential entrant. It is straightforward to extend the model to several incumbents and entrants. Properties of the profit functions are spelled out and justified. We then shortly present the moral hazard problem of the entrant and introduce the possibility to costly reveal the quality of the entrant's product. 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.[6] 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 (alternatively RPM-clauses lead to the same simplification). Hence, only the non-linear pricing decisions of the producers have to be analyzed.

Section 3 presents the public good argument in favor of exclusive dealing and discusses specific investments at the retailer as a commitment to excluding the competitor from selling through the same distribution channel. Section 4 discusses associated antitrust issues.

2   Exclusive dealing clauses and market entry

2.1   The model

In may markets qualities of established firms are known to consumers. Those established firms which produce low quality are left out of the picture; one can think that they do not interfere with the competition for the high quality sales which is the object of the present analysis. To make our argument simple we consider the case of one established high quality firm, the incumbent, and a competitor who is the potential entrant.

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: 1) the established producer might loose reputation when selling jointly with an entrant of low quality. 2) established firms might gain a competitive

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[6]This market structure is often adopted for retailing and follows the Chicago school thinking. E.g. Bornstein (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 (which is believed to be the case in Europe, see European Commission, 1997a) our analysis would need substantial modification.

advantage when unmasking a competitor to be 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 second mechanism. Hence we consider a market in which the quality of the incumbent is beyond doubt if he has been investing in reputation and cannot suffer from entry. We will not model how an incumbent builds up reputation and simply assume that he has perfectly revealed quality by certifying it.

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 $\pi_R = \sum_i ((p_i^R - p_i - c_i^R)x_i + t_i) - f$ where f 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 $f - \sum t_i \leq 0$. Retailers receive no share of the profits because they have no bargaining power. This holds if the manufacturers can change retailers at no cost.[7] If there is only

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[7]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. Also, one can replicate our results for the case where retailer

one manufacturer this manufacturer will set the transfer equal to f 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 fixed cost of retailing such that the incumbent pays less than in the case of the exclusive use of the retailers; however, we rule out by assumption direct side-payments to the incumbent. Without affecting our arguments we assume in particular that in the case of shared retailing the entrant pays f as a fixed payment to each retailer. 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 coincides 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 denoted by π_I^+.

In this section 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 al-

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networks do not operate with the same efficiency, i.e. c_i are not the same between retailer networks (compare with appendix 3 where retailing costs f are heterogeneous which leads to qualitatively the same results).

lowing 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 his 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.

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 in the main part of the text.

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 to this extension.

As it will become clear, under our assumptions stage 4 is black-boxed in the profit functions since we assume that prices depend only upon whether entry has occurred or not and upon the perceived quality of the entrant (prices signals cannot contain signaling information in our simple model).

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

2.2 Entry and quality choice under perfect information

We start by presenting 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. We discuss properties of the profit functions and the particular market environments which give rise to these profit

functions.

Consider the subgame after stage 4 and entry has occurred. 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. As we will discuss, these assumptions are met for a large class of market environments.

- 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 model of pure vertical product differentiation and price competition. It means that as a high quality firm can extend its demand and/or increase price-cost margins.

When consumers and retailers meet only once this assumption can be understood as follows. Consider a market in which goods are substitutes. Brands are exogenously horizontally differentiated and in addition brands are defined by quality. A.1 is met in such a market with sufficient horizontal product differentiation (which can also be interpreted as heterogeneous search costs or as random utility). For examples of such a model see Economides (1989) and Anderson, de Palma, and Thisse (1992, pp. 236). Alternatively, A.1 is met in Cournot models in which brands are only distinguishable by quality (see Sutton, 1991, pp. 48, and 1998, pp. 507). For a discussion of these and other models see Garella and Peitz (1999). A.1 seems to us the natural assumption to make in many branded consumer goods markets.

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 stage 1. At stage 2 the entrant joins the retailer network.[8] In subgame perfect equilibrium profits are $\pi_I(H)$ and $\pi_E(H) - e - f$. The incumbent has

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[8] 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 pays a share of the fixed cost λf, $\lambda \in [0, 1]$.

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.

2.3 The moral hazard problem

Now we introduce asymmetric information. In the present subsection we analyze the 5-stage game under the restriction that the incumbent cannot exclude the entrant from access to the retailer network he is using. The entrant of course can decide whether to join or to sell through a different retailer network. As above we assume that the entrant, if this does not reduce her profits, sells through the incumbent's retailer.

In many real world cases consumers do not observe the quality of a good. Since manufacturers gain if they are believed to sell a brand of high quality they have an incentive to misrepresent quality—quality being their private information and costly to produce (see Farrell, 1986). 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. 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.

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.[9]

In case of entry consumers have to form beliefs based on the observation of the prevailing distributional arrangements and whether or not the entrant has certified. There are 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. An entrant would enter with high quality and sell through the incumbent's retailer if $\pi_E(H) - e - f - g \geq 0$. Indeed, when certification costs are negligible, the model resembles the model with perfect information and the only possible role of the retailing arrangement would be to save the certification cost (see Garella and Peitz, 1999). 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*

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[9]Concerning the possible role of prices or other variables as signals, they cannot play a role in our simple model. In an extended model one would need to show that certification is a cheaper way to reveal quality than other signals or that, in the case of price signals, these are rendered unstable in the presence of the possibility of certification. Instead of considering certification one might want to consider a model in which a share of consumers is perfectly informed of the entrant's quality. in this case chosen and perceived quality enter as arguments the reduced profit functions (such as in Matthews and Fertig, 1990). Also in such a model an entrant can gain from shared retailing while the incumbent has only an interest in excluding a low quality entrant thus confirming our main result.

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. Of course, irrespective of the signaling instruments at hand 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.

2.4 Exclusive dealing clauses as a solution to the moral hazard problem

In the present subsection we give a precise content to the idea that allowing for exclusivity clauses helps solving the moral hazard problem for the entrant.[10] 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.[11]

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

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[10]The present model formalizes signaling through a *competitor*. The possibility of brand signaling has been studied before in the case of a multi-product firm (Wernerfelt, 1988; Choi, 1998) and in the case of a vertically related firm (Chu and Chu, 1994; Biglaiser and Friedman, 1994). As another difference, the signaling mechanism in these papers is based on a potential reputation loss whereas in our paper the reputation of the signaling player is beyond doubt. As a consequence, we restricted our analysis to an atemporal product market. A similar set-up to ours with two informed players has been chosen by Matthews and Fertig (1990) to study the signaling role of advertising.

[11]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.

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 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

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

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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 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 type 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 of type L, the incumbent has an incentive to enforce the exclusivity clauses and to force the entrant to independent retailing.

Hence 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 incumbent's threat of exclusion from the distribution channel 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.*

The above proposition is the main result of the analysis. It gives content to the idea that a prohibition of exclusivity clauses under moral hazard can only prevent the attainment of socially desirable outcomes.

Our previous result focused 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.

2.5 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. As stated in Proposition 1 the signaling role of waving the exclusive dealing clauses holds whenever $\pi_E(H) - \pi_E(L) > g - d$. 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).

Results easily translate into a setup of adverse selection in which Nature and not the potential entrant chooses quality. Under adverse selection Nature's choice is at stage 1a and afterwards the potential entrant decides whether to enter at stage 1b. If $\pi_E(L) - e - f < 0$, there exists 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. If $\pi_E(L) - e - f \geq 0$, entry of low quality always occurs. If consumers believe in the signaling role of shared intermediation the incumbent waves the exclusive dealing clause if Nature has chosen H and enforces it if Nature has chosen L in any PBE. In such a market exclusive dealing clauses are observed and the clause screens between high and low quality entrants.

To complete the preceding discussion we discuss the issue of robustness of our results in four directions. First, note that our model neglects the additional disadvantage of entrants that they may have to use a more costly distribution channel in case of exclusion. As we show in appendix 2, our

main argument is robust to this extension. In addition, the condition for a unique outcome is more likely to be satisfied.

As another limitation of our simple model one may consider our restrictive contract space. As argued at several instances, our basic result holds also in the case of bargaining between incumbent and entrant on how to split the joint gain from shared retailing (presuming that bargaining is efficient).

Third, the question might arise whether in an extended model separate instead of shared retailing can be a signal of product quality. The answer is negative in any model in which the entrant is not forced to apply for shared retailing because a low quality entrant can always mimic a high quality entrant in the choice of separate retailing.

Fourth, in our simple model the retailer does not play any role as a player which seems appropriate in the world of perfect retailer competition. However, if the retailer does obtain positive profits, e.g. a share of the profits of the firms whose products it sells, then one can formulate conditions on profit functions (strengthening in particular A.1) such that the retailer refuses to sell a low quality product of an entrant. If in this case the incumbent cannot use exclusive dealing contracts, it is the retailers' action which signals low quality of an entrant by refusing access to the retailing structure.

3   Specific investments, commitment, and foreclosure

An argument in favor of the legality of exclusive dealing clauses which abstracts from moral hazard can be found in the literature, namely the free-riding by competitors on the investment in services at a particular retailer (Marvel, 1982; Ornstein, 1989; Besanko and Perry, 1993).[12] This argument is different from the one we have presented here. It is based on the idea that the investments have a value for the firms that sell at a retailer, for instance because the services provided by the investments are of a public good nature. Then, if a manufacturer can ensure exclusive retailing (Marvel, 1982) he can appropriate the monopoly rent from the investment and thus has an incentive to provide the service. Under exclusive dealing the service

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[12] In an analysis of leading U.S. antitrust cases on exclusive dealing the analysis by Frasco (1991) suggests that the explanation by Marvel (1982) is highly relevant. Empirical evidence in favor of this argument is provided by Heide, Dutta, and Bergen (1998).

is tied-in to the product sold. New entrants could pay the incumbent for the provision of services under the condition that the incumbent waves the exclusivity rights. Again, the incumbent is provided with the incentive to invest, and the exclusivity clauses are renegotiated if this is to the advantage of all parties. Efficiency rather than foreclosure, in this line of reasoning, motivates the clauses. As it is for us, furthermore the clauses per se have no commitment value.

Our argument that exclusivity clauses are procompetitive is not based on the protection of investments at the retailer. Yet, the possibility of investing and the exact nature of the investments are of concern for us. In particular, the investments at the retailer may be such that when another firm is selling through the same retailer the profit of the firm which invested are reduced. This can happen for instance because the value of these investments is linked to separate retailing. If the incumbent has created intangible assets with a value which is reduced if shared retailing intervenes, then he has an interest to enforce exclusivity independent of the type of the entrant. This kind of specific investments, clearly, in our framework creates a commitment.

Specificity in general is simply taken to mean that an investment looses part or all of its value if the link associating the investment to a particular activity or relationship is cut. In the manufacturer-retailer setup this would translate into the retailer having part to the surplus generated by the investments due to a hold-up power. We however suppose, to the extreme opposite, that the retailer can be changed at no cost, namely without generating a loss in the value of the investment, so that there is no hold-up possibility on that side. The classical underinvestment problem in a bilateral relationship[13] is not what we want to point out here because retailers have no share of the profits. (Clearly, if retailing was imperfectly competitive this would not hold and the analysis should be modified.) What is relevant, rather, is that sharing a retailer with a second or more manufacturers (hence, introducing third parties to the relationship) may break a link which may be essential to keep the value of the investment intact. In this sense, the incumbent has an interest to protect an investment because without protection other parties cannot compensate him for the loss they inflict. Exclusive dealing is a way to ensure that these losses do not arise. The literature on exclusive dealing so far has

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[13]That is, either the manufacturer or the retailer may have an insufficient incentive to undertake the investment if he has to share the benefits with the other party (see Klein, Crawford and Alchian, 1978; Grossman and Hart, 1986).

not considered this aspect in detail.

To make our discussion simple we shall use the term "entry-sensitive" to designate a specific investment which looses value if an entrant is accommodated at the same retailer. We believe that many incumbents' investments at the retailer are of this sort. In particular brand differentiating investments at the retailer lead to a reduction in the manufacturer's profits in case of shared retailing. Brand differentiation via retailers seems to be particularly important for life-style and luxury goods in which the shopping experience reflects the "value" of the brand.

Entry-sensitive specific investments can create commitment in the presence of asymmetric information in contrast to investments which provide positive spillovers to other firms, or which have the character of a public good. As they tend to discourage entry, these investments can have a larger value for the incumbent than they have for society, and there can be too much of them as a result. Hence, there may not only be entry deterrence but also overinvestment.

In the presence of investments, profits have to be conditioned upon whether separate or common retailing applies. Given the incumbent's investment profits without side payments under separate retailing are denoted as $\pi_I(q, 1)$, and $\pi_E(q, 1)$ and under shared retailing as $\pi_I(q, 2)$, and $\pi_E(q, 2)$. There are positive spillovers for the entrant if $\pi_E(H, 2) > \pi_E(H, 1)$. Without moral hazard the entrant is of high quality. The argument following Marvel (1982) applies if

$$\pi_I(H, 2) + \pi_E(H, 2) > \pi_I(H, 1) + \pi_E(H, 1).$$

Then the property right of the returns from investments are assigned to the incumbent through the possibility to enforce the exclusivity clauses. This provides the incentives to the incumbent to invest since the inequality implies that the entrant can compensate a potential loss in the incumbent's profits due to shared retailing. There clearly exist contracts between incumbent and retailer such that the incumbent has an incentive to grant access to the retailing network.

However, whenever

$$\pi_I(H, 2) + \pi_E(H, 2) < \pi_I(H, 1) + \pi_E(H, 1)$$

the entrant cannot compensate the incumbent. This is independent of the nature of the spillovers, and clearly the investment does not have the character of a public good. If $\pi_I(H, 2) < \pi_I(H, 1)$ the specific investment is entry

sensitive: the incumbent looses under shared retailing and therefore is protected by exclusive dealing. Note also that after the investment (and with the entrant kept out) the incumbent's profits can be higher or lower than before the investment. Under complete information the entrant chooses high quality and enters and the incumbent only invests if this is profitable. Typically, such an investment should be thought of as welfare improving: higher profits result from a higher willingness to pay of the consumers. Hence without moral hazard independent of the nature of the investment exclusive dealing clauses protect the investment and are typically welfare improving.

In the presence of moral hazard, the incumbent might be able to choose investments such that

$$\pi_I(H, 2) + \pi_E(H, 2) < \pi_I(H, 1) + \pi_E(H, 1) - g.$$

In this case an entrant cannot propose an incentive compatible contract with side payments such that the incumbent grants access to the retailing network. With the assumptions of section 2 a potential entrant either does not enter or produces low quality. The investment is a way to obtain foreclosure if $\pi_E(L, 1) - e - f < 0$, $\pi_E(H, 1) - e - f - g < 0$, and monopoly profits given the investment are greater than $\pi_I(H)$, where the investment and retailing structure are chosen by the incumbent ignoring the effects on entry.

Of particular interest is a situation in which optimal investment given entry would have increased welfare but the strategic choice of investment reduces welfare. In this case the efficiency argument in favor of exclusive dealing is invalidated by the presence of asymmetric information. Antitrust authorities should check these investments which provide a tie-in with scrutiny. The antitrust implications are discussed in more detail in section 4.

4   Lessons for antitrust and conclusions

We believe our analysis to be of interest for antitrust issues of vertical restraints in the presence of asymmetric information. Vertical restraints covered by our analysis are exclusive dealing clauses, refusals to deal, boycotts, and certain forms of tie-ins. We highlighted the pro-competitive role of exclusionary clauses in the presence of asymmetric information. As shown in section 2 exclusive dealing clauses enable an incumbent to exclude quality defections from sharing the retailer network and this mechanism can solve

the moral hazard problem. On the other hand, when an incumbent can commit to exclusionary clauses by investments these investments may be used as entry deterrents thus destroying the pro-competitive effect and welfare is reduced even when compared to the situation in which exclusive dealing clauses were prohibited. Our analysis of asymmetric information suggests a favorable treatment by the courts of exclusive dealing clauses applied to competitive retailing unless either one of the following conditions is violated:

(1) availability of alternative retailers which are not too costly to be used by the entrant, i.e. sufficiently low alternative costs of retailing which implies that there are low barriers of entry due to retailing–a view expressed by the essential facility theory or bottleneck theory (compare Appendix 3).

(2) the non-commitment value of the vertical restraint, in particular the incumbent did not make brand differentiating investments at the retailer.

We comment on the two conditions for a favorable treatment of exclusive dealing under competitive retailing.

On (1): In antitrust cases with exclusionary clauses or vertical integration one should evaluate the possibility of foreclosure with the appropriate definition of the relevant market. The relevant market in the presence of asymmetric information is not the whole market for a particular good but for goods which are perceived to be of high quality. Competitors of well-known low quality should not enter in the analysis and retailers who only sell these goods often cannot be seen as a possible distribution channel for a high-quality entrant: the distribution channel is less attractive to a high-quality entrant because e.g. potential buyers of high quality do not visit such a retailer. Extending our analysis to markets in which retailers are imperfectly competitive is beyond the scope of this paper but clearly relevant for antitrust policy. We hope to address this issue in future research.

On (2): The exclusivity clause assigns the property right to the incumbent and enables a contractual arrangements between incumbent and entrant according to which the entrant provides a side payment for joining the incumbent's retailer network. Exclusive dealing clauses can be used as an enforcement rule of the side payments by the service provider. If investment can be made such that joint profits under shared retailing are less than under separate retailing, the possibility of foreclosure arises. Only if there are social benefits from such investments which outweigh the costs of foreclosure, the antitrust authority should not intervene. In case the investments at the retailer by the incumbent can be ascertained to be welfare reducing the prescription is clear-cut: the direct (welfare reducing) and indirect

effect (entry deterrence) can be removed either by prohibiting the brand specific investment. If the two effects go in different directions the antitrust authority has to cope with the difficult task of weighing the efficiency effect against the social costs of foreclosure. Whenever possible the antitrust authority should not rule out exclusive dealing clauses but additional contractual clauses which lead to brand specific investments at the retailer. Only when socially damaging brand specific investments cannot be controlled independently the exclusivity clauses should be prohibited.

Seen in this light, those franchising arrangements and vertical integration which include brand differentiating investments at the retailer, should be analyzed more critically than pure exclusive dealing clauses because they may enable incumbent firms to higher commitment to exclusivity.[14]

The prescription against brand specific investments however should be read with extreme caution. Indeed, ruling out brand specific investments at the retailer can lead to a market breakdown if the production of high quality is very costly because the profits of the incumbents are reduced by the entry of a high quality competitor and thus the incumbents may not be able to recover their investments in high quality under entry.

To summarize, the prohibition of exclusive dealing clauses and similar vertical restraints may have unexpected consequences in the presence of asymmetric information. Namely, they may be pro-competitive and thus desirable under asymmetric information whereas they do not play any beneficial role in the corresponding market environment under perfect consumer information. Also, when they are welfare-enhancing under perfect information they may be welfare reducing under asymmetric information. Our analysis suggests that asymmetric information should be taken serious in the analysis of non-price vertical restraints.

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[14]The reputation aspect of exclusive dealing is recognized e.g. in Australian antitrust law. Exclusive dealing can protect the reputation of a brand (and the competitive advantage with respect to low quality competitors without reputation). However, according to Section 47 exclusive dealing practices should be prohibited if they lessen competition. In the context of franchising "franchisees should not be deprived of their freedom to purchase goods from third parties in so far these goods are of an adequate quality" (OECD, 1994, p. 118).

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

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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. 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

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

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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.

Appendix 3: more costly alternative retailers and cost raising strategies

We extend the model by introducing exogenous or endogenous cost disadvantages of the potential entrant. Exogenous disadvantages stem from heterogeneous possibilities of the firms; endogenous disadvantages are due to strategic behavior by the incumbent. The potential entrant may incur different costs: she has to pay the entry cost which is sunk, the costs for the retailing network which is denoted by f when sharing the retailing network of the incumbent and by f' under separate dealership. (In the main part we assumed that $f = f'$.) The potential entrant furthermore may have to pay the cost of certification g, the costs of high quality d and the cost of production (of low quality) c. With the notation as before a high-quality entrant affords profits $\pi_E(H) - e - f$ under shared retailing. Whenever this expression is negative the outcome $H, N, 2$ cannot be supported by a PBE. In the standard case where inequalities $\pi_E(H) - e - f' - g < 0$, $\pi_E(L) - e - f < 0$, and $\pi_E(L) - e - f < 0$ are satisfied the incumbent does not face entry if $\pi_E(H) - e - f < 0$. Consequently, an exogenous cost disadvantage of the potential entrant with separate dealership $f' - f > 0$ does not matter if exit is impossible or if the participation constraint $\pi_E(H) - f' - g \geq 0$ is not binding. In other words, our results on PBE are not affected by a less efficient retailer network of the entrant as long as the high-quality entrant makes nonnegative operating profits (ignoring the entry costs). Note that as long as the participation constraint from above holds, the scope of the equilibrium refinement (Proposition 4) is enhanced because the inequalities $\pi_E(L) - e - f' < 0$ and $\pi_E(L) - e - f \geq 0$ may hold in which case the set of no entry PBE is generically not KM-stable with retailing costs f'. (For this argument to be applicable one needs $\pi_E(H) - \pi_E(L) - g > -e$ which is always satisfied because of A.5).

An incumbent who wants to deter entry has an interest to raise the rival's costs to a level which make entry unprofitable if the additional costs of this strategy, which is incurred by the incumbent, is offset by the profit gains from no entry. As an immediate implication from the relevant inequalities, cost-raising strategies which affect f' and g do not have any impact as long as $\pi_E(H) - f' - g \geq 0$. This says that e.g. increasing his own retailer network

beyond the optimal number of retailers the incumbent might raise the costs of retailing of a potential entrant with a separate network but this strategy will not be pursued by the incumbent if $\pi_E(H) - f' - g \geq 0$ for all f' which are incentive compatible with the incumbent. The same is true if instead the cost-raising strategy operates on g.

Cost-raising strategies which operate on d or e are used by the incumbent if they are not too costly. In these cases the argument is the standard one on cost-raising strategies (see e.g. Salop and Scheffman, 1983 and 1987, Krattenmaker and Salop, 1986, and Scheffman, 1992).

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