Joachim Klein; Hans Zenger:

Predatory Exclusive Dealing

Predatory Exclusive Dealing[*]

Joachim Klein[†]   Hans Zenger[‡]

June 09, 2009

Abstract

While the previous literature on exclusive dealing has been concerned with the question of how exclusive dealing can raise static profits, this paper analyzes the question of how exclusive dealing can be used to predate in a dynamic context. It is shown that exclusive dealing may arise even if it reduces static profits. Exclusivity provisions may not only allow excluding efficient competitors, but indeed are often a cheaper exclusionary tool than predatory pricing. This is the case if the prey's access to finance is not too limited. Furthermore, it is more likely that exclusive dealing is preferable compared to predatory pricing the more market power the predator has with respect to the prey.

JEL classification: K21, L11, L12, L41, L42

Keywords: exclusive dealing, predation

[†]Munich Graduate School of Economics, University of Munich, Kaulbachstr. 45, D-80539 Munich, Germany, Email: joachim.klein@lrz.uni-muenchen.de

[‡]European Commission, Chief Economist Team, Directorate-General for Competition, 1000 Bruxelles, Belgium, Email: hans.zenger@ec.europa.eu.

1

1 Introduction

The Chicago School's critique of antitrust action against exclusive dealing is based on the argument that (under the assumptions of those models) exclusive dealing is not profitable for firms in the absence of efficiencies like the protection of prior investments (see, for instance, Bork, 1978). From this it has concluded that exclusive dealing must be beneficial for welfare because it is only profitable for firms if there is an efficiency rationale.[1]

The subsequent literature has shown, however, that exclusive dealing may be anticompetitive if the implicit assumptions of the Chicago School are relaxed. Much of this literature has focused on the exclusion of potential entrants. Exclusive dealing is often profitable in this case because potential entrants are assumed not to be in the position of making counteroffers at the time the exclusive contract is accepted (they are not in the market yet). Under certain circumstances incumbents may therefore exploit contracting externalities to prevent entry (see Aghion and Bolton, 1987, Rasmussen et al., 1991, Innes and Sexton, 1994, Segal and Whinston, 2000b, Fumagalli and Motta, 2006, Simpson and Wickelgren, 2007, and Abito and Wright, 2008). The identified circumstances under which exclusive dealing can anticompetitively exclude rival incumbents are more restricted (see Mathewson and Winter, 1987, O'Brien and Shaffer, 1997, and, in particular, Bernheim and Whinston, 1998).[2]

What is common in all of the above models is that product market competition takes place in a one-period game. The economic literature has therefore been concerned with the question of under which circumstances exclusive dealing may increase the static profits of a firm. Many recent antitrust procedures against exclusive dealing, however, have been concerned with another

---

[1] See Marvel, 1982, Segal and Whinston, 2000a, and De Meza and Selvaggi, 2009 for efficiency justifications of exclusive dealing.

[2] Spector (2007) provides a synthesis of the different strands of the literature.

potential motivation to engage in exclusive contracts: predatory exclusion of active rivals. Strong incumbent companies are sometimes accused of accepting lower profits in one period to exclude an incumbent competitor and recouping those losses in subsequent periods where monopoly rents can be earned.

Indeed, U.S. antitrust enforcement currently seems to consider only this second type of exclusive dealing as anticompetitive while typically not intervening against exclusive dealing of the sort discussed in the literature (which raises, rather than reduces current profits). One test that is considered in the U.S. is the profit-sacrifice or no-economic-sense test (see Salop, 2006). This test checks whether an exclusive contract was consistent with (static) profit maximization. If it is found that profits were sacrificed (and hence exclusive dealing made no economic sense from a static perspective), exclusive dealing is prohibited because it must have been predatory. If no profits were sacrificed, exclusive dealing may be allowed, in line with the Chicago School argument.

To our knowledge, predatory exclusive dealing has so far not been analyzed formally in the economic literature. This paper tries to fill this gap by investigating the ability of firms to use exclusive dealing in order to predate. Our model of predation loosely follows Bolton and Scharfstein (1990), who first formalized the long-purse story of predation, according to which agency problems in financial contracting may allow predatory pricing to exclude rivals.[3] By allowing for exclusivity clauses in a model of predation, we show that exclusive dealing may arise in equilibrium even in circumstances where it can not be profitable for a one-period profit maximization strategy.

---

[3]In some sense, our paper takes the opposite perspective of Bolton and Scharfstein (1990). While their paper is detailed in its modeling of the financial market, it is crude in the way it treats the product market. In particular, the price formation on the product market is not derived endogenously from a model of competition. Our paper, on the other hand, is detailed in the modeling of the product market while being crude in the treatment of the financial market. In particular, the financing constraints from the financial market are not derived endogenously from a model of asymmetric information, but are assumed to be exogenous.

Predatory exclusive dealing may not only be a possible strategy for dominant incumbents to exclude rivals; indeed, it is often a cheaper way of predating than predatory pricing. As shown below, this is the case if the prey's access to capital is not too limited, making ordinary price predation expensive. It also turns out that the more market power the predator has with respect to the prey, the more likely it is that exclusive dealing is preferable for the predator compared to predatory pricing.

Besides predatory pricing, other strategies of exclusion in a dynamic setup have been considered in the literature, under which firms trade off lower current profits for larger future profits. Carlton and Waldman (2002) describe how bundling can be used in a predatory way in evolving network industries. Ordover and Shaffer (2007) show that rebate schemes can be used to exclude rival incumbents.

The paper is organized as follows. Section 2 sets up the model. Section 3 characterizes the equilibria of a static game of exclusion, while Section 4 analyzes the equilibria of a dynamic game and presents the main results of the paper. Section 5 extends the model to a situation where firms can offer non-linear pricing schemes and Section 6 concludes.

2 The model

The model combines the intuitions of Bolton and Scharfstein (1990) and Bernheim and Whinston (1998). Bolton and Scharfstein analyze a dynamic game of price competition in which exit may occur, but do not allow for exclusive dealing clauses. Bernheim and Whinston (1998), on the other hand, allow for exclusivity provisions, but consider only a static pricing game.

In our model, there are two upstream firms 1 and 2, each with fixed costs F and marginal cost c,

who compete in two periods $\tau = 1, 2$. In each period, firms first simultaneously announce whether they insist on exclusivity or not, as in Mathewson and Winter (1987). Then they simultaneously set prices p_1 and p_2.[4]

The products are purchased by a large number of identical downstream buyers who have preferences over the two goods according to the standard Hotelling model. Each purchaser wants to buy a fixed number of units in each period, which is normalized to 1. Each (marginal) unit $x \in [0, 1]$ gives purchasers utility $u_1 - tx$ if bought from firm 1 and utility $u_2 - t(1 - x)$ if bought from firm 2, where t as usual denotes the degree of product differentiation between goods 1 and 2. As u_1 and u_2 may differ, we allow for vertical product differentiation in addition to the horizontal differentiation already inherent in the Hotelling model. Without loss of generality, let $u_1 \geq u_2$ and denote $\Delta u := u_1 - u_2 \geq 0$ as the *degree of dominance* of firm 1.[5,6] As usual in the Hotelling model, we will assume that u_1 and u_2 are large and that both firms have the capacity to serve the whole market. As a result, there will be full market coverage in equilibrium. Moreover, let $\Delta u < t$, which implies that it is socially efficient that at least some units of firm 2 are sold (if it is active).

The timing of the dynamic game is as follows. The game starts when both firms have sunk their fixed costs in period 1. The firms then play the stage game described above, consumers make their orders and first period profits are realized. If the firms expect non-negative profits in period 2 and have sufficient funds to finance their ongoing operation, they remain in the market,

---

[4]In order to allow for the possibility of exclusion, we assume that firms can not offer long term contracts but set prices in each period, as is common in models of predation. Note that firms' pricing strategies are restricted to linear schemes in this section. In Section 4, we extend the analysis to non-linear pricing (two-part tariffs).

[5]The legal definition of dominance has typically been interpreted by economists as being equivalent to a high degree of market power or a low elasticity of demand. In our model Δu is indeed positively related to firm 1's profits and negatively related to its elasticity of demand.

[6]It would also be possible to introduce differentiated marginal cost parameters. However, this affects possible equilibria in the same way as differentiated utility parameters. In order to save on notation, we therefore omit this type of differentiation. The results can be easily reinterpreted to account for cost differentials.

and the stage game is repeated in the second period. If one firm exits the market after period 1 (a possibility that will be specified further below), this firm will not have to incur fixed costs for period 2, and the other firm will be able to charge monopoly prices. Second period profits are discounted by some common discount factor δ, which we normalize to one. Where appropriate, we interpret the results to account for the possibility of lower discount factors.[7]

In line with Bolton and Scharfstein (1990), let one firm be the predator with sufficient access to capital and the other firm be the prey, which is financially constrained. Due to the assumption that $u_1 \geq u_2$, firm 1 is the stronger firm in terms of market share in a standard one-period Hotelling game. It therefore makes sense to let firm 1 (the "dominant" firm) be the predator and firm 2 the prey. We will assume that firm 2 does not obtain continued financing by its investors if its profit π_2 falls below some threshold $\bar{\pi}_2$ in the first period stage game. For instance, this constraint could represent Bolton and Scharfstein's (1990) argument that the weaker firm's financiers face a problem of asymmetric information. If first period profits turn out to be low, this may either reflect the fact that firm 2 is falling prey to a predator, or that firm 2 is less efficient than firm 1 and therefore can not survive in the marketplace. As investors can not distinguish the origin of the losses, they decide to withdraw their funding if profits are below $\bar{\pi}_2$.

Firm 2 can always guarantee a profit of $-F$ by not producing anything in period 1. A possibility for predation can therefore only arise if $\bar{\pi}_2 \geq -F$, which we will assume to be the case. In the other direction, it seems reasonable that the firm will not be shut down if it makes profits. We therefore have $\bar{\pi}_2 \in [-F, 0]$, which we parameterize with

$$\bar{\pi}_2 = -\alpha F, \tag{1}$$

_____

[7]Doing so also allows reinterpreting the results for an infinitely repeated game, with $\delta > 1$ representing the fact that there is a stream of future profits deriving from periods $2, ..., \infty$.

where the parameter $\alpha \in [0, 1]$ represents the leniency of firm 2's banks. A value of $\alpha = 0$ means the banks are quite tough. Even if firm 2 breaks even, banks will shut it down. A value of $\alpha = 1$ on the other hand, means the banks are very soft. Only if firm 2 makes no sales at all it will be shut down; more moderate losses will be tolerated.

We are now ready to solve the game by backward induction starting in period 2. This is essentially the case of static exclusive dealing as analyzed in the previous literature.

3 Exclusion in a static game

There are two possible subgames that start in period 2. Either both firms are still active or firm 2 has been cut off from its funding after period 1 due to insufficient profits. If only firm 1 is active, it is easy to see that it charges the monopoly price $p_1^M = u_1 - t$, leading to demand $x^M = 1$, profit $\pi_1^M = u_1 - t - c - F$ and purchasers' rent $U^M = \frac{1}{2}t$. Whether the firm announces exclusivity or not is irrelevant: there is no competition anyway.

Next consider the case where both firms are still active in period 2. If nobody has announced an exclusivity requirement, the firms play the standard Hotelling game, which we denote as *regular pricing* for later reference. Given p_1 and p_2, each buyer purchases

$$x = \frac{1}{2} + \frac{p_2 - p_1 + \Delta u}{2t} \tag{2}$$

units of good 1 and $1 - x$ units of good 2. The best response functions of firms 1 and 2 are therefore

$$p_1(p_2) = \frac{1}{2}(c + t + p_2 + \Delta u) \text{ and } p_2(p_1) = \frac{1}{2}(c + t + p_1 - \Delta u). \tag{3}$$

This leads to a Nash equilibrium with

$$p_1^* = c + t + \frac{\Delta u}{3} \text{ and } p_2^* = c + t - \frac{\Delta u}{3},$$

so that $x^* = \frac{1}{2} + \frac{\Delta u}{6t}$, $\pi_1^* = \frac{1}{2t}\left(t + \frac{\Delta u}{3}\right)^2 - F$, $\pi_2^* = \frac{1}{2t}\left(t - \frac{\Delta u}{3}\right)^2 - F$, and the purchasers' rent is $U^* = \frac{1}{2}\left(u_1 + u_2\right) - c - \frac{5}{4}t + \frac{(\Delta u)^2}{36t}$. For later reference, note that firm 2's one-period profits are non-negative if and only if

$$F \le \frac{1}{2t}\left(t - \frac{\Delta u}{3}\right)^2. \tag{4}$$

If one of the firms has announced an exclusivity requirement, downstream purchasers have to decide whether to exclusively buy from firm 1 or from firm 2. Sourcing from firm 1 generates a higher utility for purchasers if and only if

$$p_1 \le p_2 + \Delta u.$$

The only undominated Nash equilibrium in this subgame involves consumers choosing the dominant firm ($x^{ED} = 1$) and firms choosing prices

$$p_1^{ED} = c + \Delta u \text{ and } p_2^{ED} = c.$$

The proof for this equilibrium is analogous to the standard Bertrand game with differentiated cost, where Δu corresponds to the cost differential. There is cut-throat competition, except for the cost advantage (here: utility advantage) of one of the firms. Therefore, it is costly to bribe purchasers into exclusivity.[8] The resulting equilibrium profits are $\pi_1^{ED} = \Delta u - F$ and $\pi_2^{ED} = -F$,

---

[8]As in the Bertrand game with differentiated cost, there exist additional Nash equilibria, which, however, involve

and the purchasers' rent is $U^{ED} = u_2 - c - \frac{1}{2}t$.

As $\pi_2^{ED} < \pi_2^*$ for all parameter values, it is a dominant strategy for firm 2 not to require exclusivity. Since firm 1 is the stronger competitor, firm 2 can only lose any fight for exclusivity. For firm 1, however, exclusive dealing may or may not be profitable. Comparing π_1^{ED} and π_1^*, one finds that exclusive dealing is not profitable for firm 1 if and only if

$$\Delta u \leq 3 \left(2 - \sqrt{3}\right) t. \tag{5}$$

Since $3 \left(2 - \sqrt{3}\right) t \in (0, t)$, this is a reiteration of Mathewson and Winter's (1987) result that exclusive dealing may occur in static games. In our model, exclusion in a one-period subgame arises if horizontal product differentiation is small (t is small) but vertical product differentiation is large (Δu is large).[9] For our purposes, this is just a reference point for later comparison. We will therefore now turn to the analysis of the first period to characterize the scope of predatory exclusive dealing.

4   Exclusion in a dynamic game

The previous section has shown that there are two circumstances under which exit of firm 2 can occur after period 1 even if firm 1 strictly maximizes one-period profits without sacrificing current rents to induce exit of firm 2. First, if condition (5) does not hold, firm 1 would opt for exclusivity in period 1 even if it (wrongly) expected firm 2 to stay in the market. As a consequence, firm 2's profits fall below $-\alpha F$, and it must close down. Second, if condition (4) does not hold, the competition under regular pricing is so intense that firm 2 can not cover its fixed costs of operation.

the play of weakly dominated strategies by firm 2. Here, and in what follows, we will focus on undominated equilibria.

[9]A cost advantage of firm 1 vis-à-vis firm 2 has an effect equivalent to vertical product differentiation.

In that case, firm 2 will voluntarily exit after period 1. Staying put would only inflict additional losses in period 2.

These two outcomes can be described as *exclusion by effect* because the implied strategies by firm 1 do not have the *object* of cutting firm 2 off from its funding. This is only the unintended *effect* of a strategy that maximizes one-period profits.[10] The analysis of the overall game for these two cases is trivial. In period 1, both firms play the strategy that is optimal in a static game; firm 2 exits and firm 1 earns monopoly rents in period 2. Hence, we will now turn to the more interesting situation where conditions (4) and (5) hold, in which case exclusion is not profitable absent the intent to remove a competitor from the market. If exclusion occurs in this setting, then it is *predation by object*; that is, the willful sacrifice of current profits to earn future monopoly rents.[11]

If future monopoly profits are sufficiently high, some form of predation might be desirable for firm 1. In order to decrease firm 2's profits below the cutoff threshold $-\alpha F$, firm 1 may either propose an exclusive contract (*predatory exclusive dealing*) or decrease its retail price below the level that is optimal from the viewpoint of static profit maximization (*predatory pricing*). The exclusive dealing strategy was outlined in the previous section. We therefore turn to predatory pricing now.

Given p_1, firm 2's optimal response $p_2(p_1)$ is given by (3). Plugging this into firm 2's profit

---

[10]Notice that in principle, exclusive dealing may nevertheless cause damage to consumers. For instance, even in the case where consumers benefit in period 1 because firm 1 has to bribe them into exclusivity by offering favorable conditions, they will incur future losses by facing a monopolist in period 2. That is, the question whether exit occured due to exclusive dealing (condition (5) does not hold) or whether it is a consequence of normal competitive pressure (condition (4) does not hold) may make a difference for antitrust assessment.

[11]In practice, the goal of predation may not always be virtual exit of the competitor. The predator may alternatively try to marginalize the prey by pushing it into a niche segment of the market or by making sure that the prey does not obtain the financial resources to compete in the high-quality product spectrum.

function yields

$$\pi_2(p_1) = \frac{(p_1 - c + t - \Delta u)^2}{8t} - F.$$

Setting this expression equal to $-\alpha F$ and rearranging gives the largest p_1 consistent with exclusion of firm 2, which is

$$p_1^P = c - t + \Delta u + \sqrt{8t(1 - \alpha)F}.$$

As a result, the optimal price of firm 2 is given by

$$p_2^P = c + \sqrt{2t(1 - \alpha)F}.$$

This leads to $x^P = 1 - \sqrt{\frac{(1-\alpha)F}{2t}}$, $\pi_1^P = \left(1 - \sqrt{\frac{(1-\alpha)F}{2t}}\right)\left(\Delta u - t + \sqrt{8t(1 - \alpha)F}\right) - F$, $\pi_2^P = -\alpha F$, and $U^P = \frac{1}{2}t$.

To determine the first period outcome, firm 1 compares the three possible strategies at its disposal: predatory pricing (leading to profits of $\pi_1^P + \pi_1^M$), predatory exclusive dealing (leading to profits of $\pi_1^{ED} + \pi_1^M$) and regular pricing (leading to profits of $2\pi_1^*$). The following proposition shows that all three outcomes are possible equilibria depending on the parameter values.[12] So indeed it may be optimal for firm 1 to use an exclusive dealing contract to predate. However, it may also be the case that predatory pricing is a more profitable strategy for firm 1 or that neither of the two predatory strategies is profitable.

Proposition 1 *Suppose that firms 1 and 2 compete in a dynamic pricing game. Then predatory exclusion may occur in period 1 if monopoly profits in period 2 are sufficiently large. Depending on the parameters, exclusion either takes the form of predatory exclusive dealing or of predatory pricing. Exclusive dealing may occur even in a situation where exclusivity provisions can not*

---

[12] All proofs are contained in the appendix.

increase one-period profits.

Given that both predatory pricing and predatory exclusive dealing can arise in equilibrium, the question is under which circumstances one or the other is preferable for firm 1. Proposition 2 provides a first answer.

Proposition 2 *Suppose that future monopoly profits are sufficiently large for some form of predatory exclusion to arise in period 1. Then, predatory exclusive dealing is more likely to occur if the financing constraint of the prey is soft (α is large), while predatory pricing is more likely to occur if the financing constraint of the prey is strict (α is small).*

This result reflects the main advantages and disadvantages of the two instruments. The big disadvantage of predatory pricing is that it forces firm 1 to decrease prices not only for marginal units (those that it intends to capture from firm 2 to force the latter's profits down), but also for intramarginal units. Predation is a costly exercise: the predator wants to enhance his reach, but this forces him to decrease prices. Exclusive dealing is less harmful in that respect. While it captures sales that would otherwise go to firm 2, it is easier to obtain profits on intramarginal units: At the equilibrium price under exclusive dealing, purchasers would prefer to source both from firm 1 and firm 2. However, the exclusivity clause prohibits that. Because no purchaser can obtain any units from firm 2, the choice is to purchase either all sales from firm 1 or none. Since consumers do not want to forgo firm 1 consumption (especially if Δu is large), firm 1 can save some of the rents on intramarginal units.

However, exclusive dealing is not without cost relative to predatory pricing. The big disadvantage of exclusive dealing is its scope. Exclusivity forces consumers to give up *all* of the consumer

surplus that they would enjoy from sourcing some units from firm 2. This makes it costly to convince consumers to accept an exclusivity clause, especially if firm 1's advantage Δu over firm 2 is only moderate. Predatory pricing does not suffer from this disadvantage. In fact, it can be tailored to the degree of market exclusion that is necessary to induce exit of the prey. Indeed, if a small reduction of prices is sufficient to push firm 2 into losses because the financing constraints of firm 2 are tight, then bribing consumers into exclusivity would be far too expensive. Hence, predatory pricing is more attractive if banks are tough, while exclusive dealing is more attractive if banks are soft.

The following proposition relates the foregoing discussion to the degree of dominance of the predator.

Proposition 3 *Suppose that future monopoly profits are sufficiently large for some form of predatory exclusion to arise in period 1. Then, predatory exclusive dealing is more likely to occur if the degree of dominance Δu of the large firm is large, while predatory pricing is more likely to occur if the the degree of dominance Δu of the large firm is small.*

In light of the previous discussion, the intuition behind Proposition 3 is clear. If the predator is more dominant, then it would gain a large market share even if it did not predate. Bribing purchasers into accepting exclusion is less costly because the buyers do not regret losing access to firm 2's products as much as would otherwise be the case. The cost of predatory pricing, on the other hand, is relatively large in this scenario. Recall that its disadvantage is that prices are also reduced for intramarginal units. Since a dominant firm has many of those, it is more reluctant to use this instrument.

Finally, we will relate the question of when predatory exclusive dealing occurs to a measure

of firm 1's optimal predatory price. Proposition 4 shows that a sharp distinction can be drawn to indicate under which circumstances exclusivity is profitable.

Proposition 4 *Suppose that future monopoly profits are sufficiently large for some form of predation to arise in period 1. Then, predatory exclusive dealing will always be chosen if predatory pricing would involve below-cost predation ($p_1^P \leq c$).*

Proposition 4 shows that firm 1 always prefers predatory exclusive dealing if predatory pricing is so costly that firm 1 has to lower its price below marginal costs to predate ($p_1^P \leq c$).[13] This is an interesting observation given the ongoing debate concerning whether or not above-cost predation should be prosecuted by antitrust law enforcement.[14]

The prospect of predatory exclusion substantially alters the policy implications of exclusive dealing. For instance, Krattenmaker and Salop (1986) argue, based on models of exclusion in a static setting, that exclusionary practices should be prohibited only if they allow firms to raise prices. Matthewson and Winter (1987) support this standard and argue that the famous prohibition decision in *Standard Fashion* does not pass the test because exclusivity led to significant (short-term) price decreases for purchasers who accepted exclusivity. However, as the following proposition shows, predatory exclusive dealing *always* leads to price decreases as firm 1 has to convince consumers to give up sourcing from firm 2. The proposed antitrust standard would therefore imply per se legality of predatory exclusion, a recommendation that one may question.

Proposition 5 *If predatory exclusive dealing arises, then it leads to a price decrease relative to regular pricing in the first period, ($p_1^{ED} < p_1^*$), but to price increases thereafter, ($p_1^M > p_1^*$).*

---

[13]With differentiated cost, below-cost predation can theoretically arise in our model. However, only if the predator is *less* cost efficient than the prey is this the case. If the predator has lower marginal costs than the prey, then below-cost predation can also be ruled out for differentiated cost parameters.

[14]For a discussion of above-cost predation see Edlin (2002) and Elhauge (2003), who disagree on the merits of such interventions.

We will finish this section with a short word on the welfare effects of predatory exclusive dealing. Maybe not surprisingly, these are ambiguous. Indeed, predatory exclusive dealing causes a distortion in product variety (there is no consumption of firm 2's products). It is important to note, however, that regular pricing also leads to distorted product variety, even though there is no full exclusion: While under exclusive dealing purchasers obtain too many of firm 1's products (1 instead of $\frac{1}{2} + \frac{\Delta u}{2t}$), they obtain *too few* under regular pricing ($\frac{1}{2} + \frac{\Delta u}{6t}$ instead of $\frac{1}{2} + \frac{\Delta u}{2t}$) as firm 1 exerts its market power by restricting quantity. Moreover, predation saves on future fixed costs (along the lines of Mankiw and Whinston's [1986] argument of excessive entry). Regarding consumer surplus, there is an additional trade-off. While predatory exclusive dealing leads to lower prices in period 1, it leads to higher prices in period 2. Overall, the welfare conclusions are also ambiguous here.

5   Non-linear pricing

We will now analyze an extension of our basic model that allows for non-linear pricing as in O'Brien and Shaffer (1997). Consider a game that is equivalent to our previous set-up except that firms can now set two-part tariffs. Therefore, each firm i chooses prices (L_i, p_i), where L_i denotes a lump-sum charge and p_i denotes a per-unit charge.

As before, we will first identify equilibria in the period 2 subgames. Suppose exclusivity has not been announced by any firm. If buyers purchase from both firms,

$$x = \frac{1}{2} + \frac{p_2 - p_1 + \Delta u}{2t}$$

as before. But now there are two incentive constraints that ensure that it is optimal to purchase

from both firm 1 and firm 2. The utility of purchasing from both must be larger than purchasing from either firm alone. Comparing the respective consumer surpluses for firm 1 ($u(1,2) \geq u(2)$) yields

$$L_1 \leq \frac{1}{t}\left(\frac{p_2 - p_1 + \Delta u + t}{2}\right)^2.$$ (6)

Similarly, we have

$$L_2 \leq \frac{1}{t}\left(\frac{p_1 - p_2 - \Delta u + t}{2}\right)^2$$ (7)

for firm 2. Both constraints must bind in equilibrium (otherwise, a firm could increase its profits by raising the fixed fee).

Therefore, firm 1 chooses p_1 to maximize

$$\pi_1 = \left(\frac{1}{2} + \frac{p_2 - p_1 + \Delta u}{2t}\right)(p_1 - c) + \frac{1}{t}\left(\frac{p_2 - p_1 + \Delta u + t}{2}\right)^2 - F$$

where L_1 has been substituted from (6). This gives $p_1^* = c$. Likewise, $p_2^* = c$. Hence, $x^* = \frac{1}{2} + \frac{\Delta u}{2t}$,

$$L_1^* = \frac{1}{t}\left(\frac{t + \Delta u}{2}\right)^2 \text{ and } L_2^* = \frac{1}{t}\left(\frac{t - \Delta u}{2}\right)^2$$

which leads to $\pi_1^* = \frac{1}{t}\left(\frac{t+\Delta u}{2}\right)^2 - F$ and $\pi_2^* = \frac{1}{t}\left(\frac{t-\Delta u}{2}\right)^2 - F$. Note that $\pi_2^* \geq 0$ if and only if

$$\Delta u \leq t - 2\sqrt{tF}$$ (8)

which we will again assume to hold. Otherwise exit of firm 2 would automatically occur after period 1.

Next we will investigate the subgame where one of the firms has announced an exclusivity

requirement. In this case, buyers will purchase the measure one units from either firm 1 or firm 2. As the volume is fixed, the structure of the payment (fixed or variable) is irrelevant; only the total level matters. Hence, without loss of generality, we can set $p_1^{ED} = p_2^{ED} = c$.

Buyers will purchase from firm 1 if and only if

$$L_1 \leq L_2 + \Delta u.$$

With the previous Bertrand argument, this leads to equilibrium fees of

$$L_1^{ED} = \Delta u \text{ and } L_2^{ED} = 0.$$

Firm 2 will always be excluded in this subgame, i.e. $x^{ED} = 1$. Therefore, $\pi_1^{ED} = \Delta u - F$ and $\pi_2^{ED} = -F$.

It is easy to see that $\pi_2^{ED} \leq \pi_2^*$. Therefore, firm 2 will never announce exclusivity in period 1. Exclusive dealing will be more profitable for firm 1 $(\pi_1^{ED} > \pi_1^*)$ if and only if

$$(\Delta u - t)^2 < 0,$$

which can not be the case. Hence, exclusive dealing will never be used, and regular pricing is the relevant subgame in the subgame perfect Nash equilibrium of the overall game. This result contrasts with the result of Section 3: If firms can employ two-part tariffs *exclusion can never be profitable in a one-period game.* This is in line with O'Brien and Shaffer (1997) and Bernheim and Whinston (1998), who show that Mathewson and Winter's (1987) result is reversed if non-linear pricing schemes are taken into account. Essentially, these results restore the logic of Bork (1978)

that firms can not increase their profits through exclusivity provisions.

But while exclusive dealing is not profitable in a static environment, it may still be the case that it is a useful instrument to predate on competitors. This would rationalize the view held by some observers that exclusive dealing should only be questioned by competition authorities if it can be shown to be predatory.

Assume period 2 profits are sufficiently large for some form of predatory exclusion to be optimal. Exclusive dealing is one possible strategy to predate. The equilibrium of this subgame was described above. Next consider price predation. As $p_2 = c$ is optimal for firm 2 irrespective of firm 1's choice of price schedule, its optimal fixed fee depending on p_1 can be inferred from (7) as

$$L_2 = \frac{1}{t} \left(\frac{p_1 - c - \Delta u + t}{2} \right)^2.$$

This yields profits of

$$\pi_2 = \frac{1}{t} \left(\frac{p_1 - c - \Delta u + t}{2} \right)^2 - F.$$

In order to predate, these profits have to be pushed down to $-\alpha F$. This occurs if

$$p_1^P = c + \Delta u - t + 2\sqrt{t(1 - \alpha)F}. \tag{9}$$

Therefore

$$L_1^P = t - 2\sqrt{t(1 - \alpha)F} + (1 - \alpha)F,$$

$x^P = 1 - \sqrt{\frac{(1-\alpha)F}{t}}$, and $\pi_1^P = \Delta u - F + \sqrt{\frac{(1-\alpha)F}{t}} (t - \Delta u) - (1 - \alpha) F$. Comparing π_1^{ED} and π_1^P then yields the following proposition.

Proposition 6 *Suppose that firms 1 and 2 compete in a dynamic pricing game with two-part tariffs. Then, neither of the two firms will impose an exclusivity requirement on purchasers.*

In other words, there is a one-to-one relationship between the environment that allows exclusion to be profitable in a one-period setup and the environment that allows exclusion to be profitable in a dynamic setting. In the logic of Bernheim and Whinston (1998), exclusive dealing can only be profitable in the absence of efficiency motives if there are contracting externalities. As shown in Sections 3 and 4, one such imperfection is the case where firms are restricted in setting non-linear tariffs.[15] While Proposition 6 (and the previous results by O'Brien and Shaffer, 1997, and Bernheim and Whinston, 1998) calls for caution in marking exclusivity provisions as anti-competitive, there are at least two important reasons why the situation depicted in the previous sections, where predatory exclusive dealing could arise, are relevant in practice.

First, the assumption of two-part tariffs with full knowledge of the demand curves of individual purchasers is clearly extreme. Perfect price discrimination of the sort assumed in this section, which allows full extraction on residual demand curves, is typically not observed in the real world. However, once marginal cost pricing on incremental units can not be maintained (say, because firms do not know purchasers' individual demands with certainty), we again enter a world with contracting externalities. As Spector (2007) notes, nonlinear pricing together with asymmetric information resembles linear pricing. We are therefore back in the scenario of Proposition 1; that is, predatory exclusive dealing may occur.

Second, even if firms possess the large informational requirements leading to Proposition 6, they may still prefer exclusive dealing over predatory pricing because it is less easily detectable

---

[15] The argument readily extends to the case where firms can use two-part tariffs, but can only increase fixed fees up to some limit $\bar{L}$, perhaps for fear of antitrust prosecution of price discrimination. It is easy to show that predatory exclusive dealing is profitable for firm 1 provided that $\bar{L}$ is not too large.

as a predatory strategy. This is shown in the following proposition.

Proposition 7 *Suppose that firms 1 and 2 compete in a dynamic pricing game with two-part tariffs. Then predatory pricing always involves below-cost predation ($p_1^P < c$), while predatory exclusive dealing can always be carried out with above-cost predation ($p_1^{ED} \geq c$).*

As a result, competition authorities may be able to infer predatory pricing from cost observations if firms use non-linear pricing schemes. Predatory exclusive dealing, on the other hand, can always be carried out with incremental prices above cost. Thus, it is likely to be more difficult for a competition authority to actually prove that the predator has sacrificed profits by offering exclusive contracts.

In summary, we believe that the result of Proposition 5 should be seen as pointing to the necessary conditions for predatory exclusive dealing to arise, rather than ruling it out as a matter of principle. In the limiting case of full information and perfect non-linear pricing, predatory exclusive dealing will not arise. However, in a less than perfect world, the intuition of the main body of our paper again provides the relevant framework of analysis.

6   Conclusion

This paper has introduced exclusivity clauses into a model of predation along the lines of Bolton and Scharfstein (1990). As a result, two distinct forms of predatory exclusion arose in equilibrium, which are also observed in practice: predatory pricing and predatory exclusive dealing. Exclusive dealing can be a profitable strategy to exclude rivals with financing constraints, even in circumstances where exclusive contracts can never be profitable from the perspective of static profits.

The more market power a predator has on the product market, the more likely it is that predatory exclusive dealing is a more profitable exclusionary strategy than predatory pricing.

The previous literature on exclusive dealing has concluded that the exclusion of existing competitors (as opposed to abstract potential entrants) can only have anticompetitive effects under particular conditions - for instance, if there are contracting externalities from related markets (see Bernheim and Whinston, 1998, and Whinston, 2006). This paper, in contrast, has argued that the scope for anticompetitive exclusive dealing is much larger. While exclusive dealing may often not be profitable in a static context, it may provide a cheap and effective instrument of predation.

Our model (and the related work by Mathewson and Winter, 1987, O'Brien and Shaffer, 1997, and Bernheim and Whinston, 1998) has assumed that downstream purchasers are either final consumers or local monopolists, who do not compete with each other. It would be interesting to extend the present analysis to downstream competition. Fumagalli and Motta (2006) and Simpson and Wickelgren (2007) have shown that the effect of downstream competition on the potential for exclusion is ambiguous for the case of potential entrants. Extending this work to the exclusion of competing incumbents seems to be a promising direction for future research.

7 Appendix

Proposition 1:

Proof. Assume that $u_1 - u_2 \leq 3\left(2 - \sqrt{3}\right)t$, so that an exclusive contract is not profitable in the last period of the game. Predatory exclusion occurs if

$$\pi_1^* + \pi_1^* \leq \max\left\{\pi_1^{ED}, \pi_1^P\right\} + \pi_1^M$$

From section 3 and 4, we know the values for all four profits which can occur in the dynamic pricing game. Thus we get that:

$$\frac{1}{t}\left(t - \frac{\Delta u}{3}\right)^2 \leq u_1 - t - c + \max\left\{\Delta u, \left(1 - \sqrt{\frac{(1 - \alpha)F}{2t}}\right)\left(\Delta u - t + \sqrt{8t(1 - \alpha)F}\right)\right\} \quad (10)$$

Let us first consider the case that $\pi_1^P < \pi_1^{ED}$. Thus, if predatory exclusion occurs it takes the form of exclusive dealing. For this to be a profit maximizing strategy, inequality (10) reduces to:

$$t + \frac{(\Delta u)^2}{t9} - \frac{2\Delta u}{3} \leq u_1 - t - c + \Delta u \quad (11)$$

We start the analysis for the case that both firms have the same market power. Thus, for $\Delta u = 0$, inequality (11) reduces to

$$2t - c \leq u_1. \quad (12)$$

As long as (12) is fulfilled, predatory exclusive dealing is a profitable strategy for the predator. It is straightforward to see that exclusion in the last period can not occur in this case as

$$\Delta u = 0 < 3\left(2 - \sqrt{3}\right)t.$$

Now we consider what happens when Δu changes. A marginal increase of Δu increases the profit under predatory exclusion by 1 and the profit from the pricing game without exclusion by $\frac{2\Delta u}{t9} - \frac{2}{3}$. Thus, only when $\Delta u > \frac{15}{2}t$ profits from predatory exclusive dealing increase more slowly in Δu compared to the case of no exclusion. However, when $\Delta u > \frac{15}{2}t$, Δu is also higher than $3\left(2 - \sqrt{3}\right)t$ so even if predatory exclusive dealing is no longer more profitable, exclusion will nevertheless occur as exclusion in a one-period setting.

Let us now consider the case when $\pi_1^P \geq \pi_1^{ED}$. Thus, when predatory exclusion occurs, it will be carried out by predatory pricing. For this to be a profit maximizing strategy for the predator the following inequality must be satisfied:

$$t + \frac{(\Delta u)^2}{t9} - \frac{2\Delta u}{3} \leq u_1 - t - c + \left(1 - \sqrt{\frac{(1 - \alpha)F}{2t}}\right)\left(\Delta u - t + \sqrt{8t(1 - \alpha)F}\right). \qquad (13)$$

Again, we start with $\Delta u = 0$, thus (13) reduces to

$$t \leq u_1 - t - c + \left(1 - \sqrt{\frac{(1 - \alpha)F}{2t}}\right)\left(-t + \sqrt{8t(1 - \alpha)F}\right). \qquad (14)$$

Yet again, we can see that as long as the future monopoly profit is high enough (here represented by u_1) predatory pricing is a profitable strategy. Rearranging (14) leads to:

$$2t - c - \left(1 - \sqrt{\frac{(1 - \alpha)F}{2t}}\right)\left(-t + \sqrt{8t(1 - \alpha)F}\right) \leq u_1. \qquad (15)$$

The first term of (15) is the same as under predatory exclusive dealing. Therefore, for predatory pricing to be the profit maximizing strategy for $\Delta u = 0$, the product from the brackets has to be positive. This is the case when $-t + \sqrt{8t(1 - \alpha)F} > 0$. We know that firm 2's static profit is non-negative for $\Delta u = 0$ if and only if $2F \leq t$. Since $\alpha \in (0,1)$, both conditions are fulfilled as

long as $\alpha \leq \frac{3}{4}$.

A marginal increase in Δu increases profits from predatory pricing by $\left(1 - \sqrt{\frac{(1-\alpha)F}{2t}}\right)$ compared to $\frac{2\Delta u}{t9} - \frac{2}{3}$ from the normal pricing game without predation. So for small values of Δu predatory pricing becomes ceteris paribus more likely to occur when Δu increases, while at some point the increase in Δu will make predatory pricing less attractive compared to no predation at all. Again, this is not possible in the parameter space which we allow for, i.e. $\Delta u \leq 3\left(2 - \sqrt{3}\right)t$. ∎

Proposition 2:

Proof. In the proof of proposition 1 we compared the two-period profits from predatory pricing and exclusive dealing with the profits from the pricing game without predation. Now we compare the two predation strategies with each other. Since monopoly profits in period 2 are the same after successful predation, we only need to compare the profits in period 1. Exclusive dealing is preferred by the predator when:

$$\Delta u > \left(1 - \sqrt{\frac{(1-\alpha)F}{2t}}\right)\left(\Delta u - t + \sqrt{8t(1-\alpha)F}\right)$$

Again, we start comparing the two profits for $\Delta u = 0$. In this case, the period 1 profit from exclusion is zero. Thus, the profit from predation is higher when:

$$\left(1 - \sqrt{\frac{(1-\alpha)F}{2t}}\right)\left(-t + \sqrt{8t(1-\alpha)F}\right) \geq 0$$

This is the case when $1 - \frac{t}{8F} \geq \alpha$. Thus, predatory pricing is more likely to occur if the financing constraint of the prey is strict (α is small).

Let us now consider what happens when Δu increases. The first period profit from exclusive

24

dealing increases by 1 for a marginal increase in Δu. The first period profit from predatory pricing increases by $\left(1 - \sqrt{\frac{(1-\alpha)F}{2t}}\right)$ (which is below 1 per definition) for a marginal increase in Δu. Therefore, the critical α from which on exclusive dealing is preferred to predatory pricing decreases ceteris paribus in Δu. ∎

Proposition 3:

Proof. The proof of Proposition 3 follows directly from the proof of proposition 2. The first period profit from exclusive dealing increases by 1 for a marginal increase in Δu, but the profit from predatory pricing increases by less than 1. Thus, ceteris paribus exclusive dealing becomes more likely to occur than predatory pricing. ∎

Proposition 4:

Proof. We know from section 4 that $p_1^P = c - t + \Delta u + \sqrt{8t(1-\alpha)F}$ and from section 3 that $p_1^{ED} = c + \Delta u$. We start again with $\Delta u = 0$. Since $p_1^{ED} = c$, predatory pricing leads to fewer losses in period 1 only if $p_1^P \geq c$. Otherwise, exclusive dealing dominates. As Δu marginally increases, both prices ceteris paribus increase by 1, but $x_1^{ED} < x_1^{ED} = 1$. Therefore, with a positive Δu, the optimal price under predatory pricing has to be even significantly higher than c to dominate exclusive dealing. From this follows proposition 4. ∎

Proposition 5:

Proof. From Proposition 4, exclusive dealing implies that $p_1^P \geq c$ and so

$$\Delta u \leq t - \sqrt{t(1-\alpha)F}. \tag{16}$$

$p_1^{ED} < p_1^*$ on the other hand implies that

$$\Delta u < \frac{3}{2}t. \tag{17}$$

As the right-hand side of (16) is smaller than the right-hand side of (17), the proposition follows.

■

Proposition 6:

Proof. Comparing π_{ED}^1 and π_P^1 and rearranging yields that exclusive dealing is more profitable if and only if

$$\Delta u > t - \sqrt{t(1-\alpha)F}. \tag{18}$$

The right hand side of (18) is larger than the right hand side of (8), therefore (18) can not hold. Hence, Predatory pricing must yield higher profits than predatory exclusive dealing. ■

Proposition 7:

Proof. From (9), $p_1^{ED} < c$ if and only if

$$\Delta u < t - 2\sqrt{t(1-\alpha)F}. \tag{19}$$

The right hand side of (19) is larger than the right hand side of (8), therefore (19) always holds. Moreover, as pointed out in the main text, the incremental price $p_1^{ED} = c$ is part of an equilibrium in the exclusive dealing subgame; that is, $p_1^{ED} < c$ can always be avoided. ■

References

[1] ABITO, JOSE MIGUEL AND JULIAN WRIGHT (2008). "Exclusive dealing with imperfect downstream competition", *International Journal of Industrial Organization* 26, 227-246.

[2] AGHION, PHILIPPE AND PATRICK BOLTON (1987). "Contracts as a Barrier to Entry", *American Economic Review* 77, 388-401.

[3] BERNHEIM, B. DOUGLAS AND MICHAEL D. WHINSTON (1998). "Exclusive Dealing", *Journal of Political Economy* 106, 64-103.

[4] BOLTON, PATRICK AND DAVID S. SCHARFSTEIN (1990). "A Theory of Predation Based on Agency Problems in Financial Contracting", *American Economic Review* 80, 93-106.

[5] BORK, ROBERT (1978). *The Antitrust Paradox: A Policy At War With Itself*, New York: Basic Books.

[6] CARLTON, DENNIS W. AND MICHAEL WALDMAN (2002). "The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries", *RAND Journal of Economics* 33, 194-220.

[7] DE MEZA, DAVID AND MARIANO SELVAGGI (2009). "Exclusive Contracts Foster Relationship-Specific Investment", *RAND Journal of Economics*, forthcoming.

[8] EDLIN, AARON (2002). "Stopping above-cost predatory pricing", *Yale Law Journal* 111, 941-991.

[9] ELHAUGE, EINER (2003). "Why above-cost price cuts to drive out entrants are not predatory: and the implications for defining costs and market power", *Yale Law Journal* 112, 681-827.

[10] FUMAGALLI, CHIARA AND MASSIMO MOTTA (2006). "Exclusive Dealing and Entry, when Buyers Compete", *American Economic Review* 96, 785-795.

[11] INNES, ROBERT AND RICHARD J. SEXTON (1994). "Strategic Buyers and Exclusionary Contracts", *American Economic Review* 84, 566-584.

[12] KRATTENMAKER, THOMAS G. AND STEVEN SALOP (1986). "Anticompetitive Exclusion: Raising Rivals' Costs to Achieve Power Over Price", *Yale Law Journal* 96, 209-293.

[13] MANKIW, N. GREGORY AND MICHAEL D. WHINSTON (1986). "Free Entry and Social Inefficiency", *RAND Journal of Economics* 17, 48-58.

[14] MARVEL, HOWARD P. (1982). "Exclusive Dealing", *Journal of Law and Economics* 25, 1-25.

[15] MATHEWSON, G. FRANK AND RALPH A. WINTER (1987). "The Competitive Effects of Vertical Agreements: Comment", *American Economic Review* 77, 1057-1062.

[16] O'BRIEN, DANIEL P. AND GREG SHAFFER (1997). "Nonlinear Supply Contracts, Exclusive Dealing, and Equilibrium Market Foreclosure", *Journal of Economics & Management Strategy* 6, 755-785.

[17] ORDOVER, JANUSZ AND GREG SHAFFER (2007). "Exclusionary Discounts", CCP Working Paper 07-13.

[18] RASMUSSEN, ERIK B., J. MARK RAMSEYER AND JOHN S. WILEY, JR. (1991). "Naked Exclusion", *American Economic Review* 81, 1137-1145.

[19] SALOP, STEVEN C. (2006). "Exclusionary Conduct, Effect on Consumers, and the Flawed Profit-Sacrifice Standard", *Antitrust Law Journal* 73, 311-374.

[20] SEGAL, ILYA R. AND MICHAEL D. WHINSTON (2000a). "Exclusive Contracts and the Protection of Investments", *RAND Journal of Economics* 31, 603-633.

[21] SEGAL, ILYA R. AND MICHAEL D. WHINSTON (2000B). "Naked Exclusion: Comment", *American Economic Review* 90, 296-309.

[22] SIMPSON, JOHN AND ABRAHAM L. WICKELGREN (2007). "Naked Exclusion, Efficient Breach, and Downstream Competition", *American Economic Review* 97, 1305-1320.

[23] SPECTOR, DAVID (2007). "Exclusive Contracts and Demand Foreclosure", Paris School of Economics Working Paper 2007-07

[24] WHINSTON, MICHAEL D. (2006). *Lectures on Antitrust Economics*, Cambridge: MIT Press.