Exclusive Dealing and Entry

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Abstract

This paper examines the use of exclusive dealing agreements to prevent the entry of rival firms. An exclusive dealing agreement is a contract between a buyer and a seller where the buyer commits to buy a good exclusively from the seller. One main concern of the literature is to explain how an incumbent seller is able to persuade the buyers to sign an exclusive dealing agreement that deters the entry of a more efficient rival seller. We propose a new explanation when the buyers are downstream firms and both the seller and the buyers face the threat of entry. In this case, the entry of more efficient upstream seller, by decreasing the market power of the upstream firms, can make entry in the downstream market more attractive. This can lead to further entry in the downstream market and to an increase in the competition faced by the downstream firms. Since part of the bigger surplus created by the entry of a more efficient seller is now captured by the downstream entrant firms, entry in the upstream market does not necessarily benefit the incumbent downstream firms.

1 Introduction

Exclusive dealing agreements are one of the most common vertical restraints used by firms. An exclusive dealing agreement is a contract between a buyer

and a seller where the buyer commits to buy a good exclusively from this seller. The idea that exclusive dealing agreements could prevent the entry of more efficient sellers was initially dismissed by economists. The incumbent seller would not find such an agreement profitable because his potential gain from exclusion, the monopoly profit, is lower than what he has to pay the buyer to induce him to sign an exclusive dealing agreement, the monopoly profit plus the deadweight loss. This argument assumes that buyers are final consumers. However, most exclusive agreements are made between firms, namely between producers and distributors.

In this paper, we propose an explanation for the incumbent firms to sign an exclusive contract that prevents the entry of a more efficient upstream seller. The idea is that the entry of more efficient upstream seller, by decreasing the market power of the upstream firms, makes entry in the downstream market more attractive. This can lead to further entry in the downstream market and to an increase in the competition faced by the downstream firms. Since, in this case, part of the bigger surplus created by the entry of a more efficient seller is captured by the downstream entrant firm, entry in the upstream market no longer necessarily benefits the incumbent downstream firms.

Since Aghion and Bolton (1987), a number of papers have shown how an incumbent seller may is able to persuade the buyers to sign an exclusive dealing agreements to deter the entry of a rival seller. Aghion and Bolton (1987) argue that an incumbent seller and a buyer might agree to sign an exclusive dealing contract in order to extract surplus from a more efficient entrant seller. If the contract can be renegotiated, the entrant firm would have to pay in order to be able to trade with the buyer. In their model entry is not intentionally blocked and doesn't always occur. Exclusion is a "side effect" of trying to extract the maximal surplus from the entrant when its production costs are unknown. However, once the entrant firm's costs are observable, exclusion doesn't survive three-way renegotiation. In Eric B. Rasmussen et al. (1991) and Ilya R. Segal and Michael D. Whinton (2000) exclusive dealing is used to deter entry when there are economies of scale and the entrant needs to supply enough consumers to cover its fixed costs. When buyers sign an exclusive dealing agreement, they impose a negative externality on other buyers by making entry less likely. The incumbent seller takes advantage of this externality to persuade each buyer to sign an exclusive dealing agreement.

Two recent papers, Fumagalli and Motta (2007) and Simpson and Wickel-

gren (2007), examine the effect of downstream competition among the buyers on the ability of the incumbent seller to exclude the entry of a more efficient rival firm. Interestingly, these two papers reach almost opposite results. Fumagalli and Motta (2007) argue that intense downstream competition makes exclusion impossible, because one single free buyer that buys the good at a lower price is able to increase its demand sufficiently to make entry profitable. Simpson and Wickelgren (2007) claim that the result obtained in Fumagalli and Motta is based on the fact that the buyers who sign an exclusive contract exit the market if there is one free buyer who becomes a downstream monopolist. Hence, the gain from rejecting the exclusive contract exceeds whatever side payment the incumbent is willing to offer for him to sign an exclusive contract. Instead, Simpson and Wickelgren argue that, if downstream competition is intense, buyers are forced to pass to their customers most of the benefits of buying from a more efficient seller. Hence, the gain for the buyer from not signing an exclusive dealing contract is substantially lower than the sum of the monopoly profit plus the deadweight loss. Consequently, the incumbent seller might be able to induce buyers to sign an exclusive contract. Finally, Comanor and Rey (2000) consider the case where the more efficient entrant distributor can only trade with one of the upstream firms. It is assumed that he faces much higher costs when dealing with the other upstream firm. In this case, the incumbent distributor can monopolize the market by signing an exclusive dealing with the only upstream producer with whom the entrant distributor can potentially trade.

The structure of the paper is as follows. Section 2 presents the basic model and provides the general conditions for exclusive dealing. In section 3, we assume that firms compete in quantities in the downstream market. The case of price competition in the downstream market is analyzed in section 4. Finally, section 5 concludes the paper.

2   The Model

In the upstream market there is one incumbent producer, denoted IP, that produces an input at a constant marginal cost, c_I. A more efficient rival producer, EP, may enter the upstream market selling an identical good. The $EP's$ marginal cost of producing the input, c_E, is lower than the marginal cost of the incumbent, $c_E < c_I$. However, the EP faces a fixed sunk cost, E_P, to enter the market. In case of entry in the upstream market, firms are

assumed to compete a la Bertrand. This is a common assumption in this literature which focuses on the case where an incumbent producer is trying to avoid being replaced by a more efficient entrant producer.

In the downstream market there is an incumbent distributor, denoted ID. There is also one entrant distributor, denoted by ED, which has sunk a cost of entry of E_D. Without loss of generality, distributors are assumed to have zero marginal costs of reselling the good bought in the upstream market. For simplicity, we also assume that, in case of entry, downstream firms face symmetric demand functions. We derive general conditions under which the incumbent firms sign an exclusive dealing agreement, without assuming any particular form of competition in the downstream market. We then apply our results to both the case where downstream firms compete in quantities and to the case where they compete in prices with differentiated goods.

We assume that upstream firms charge two-part tariffs to the downstream firms

$$T_k^j = A_k^j + w_k^j q_k^j \qquad j = I, E; \ k = I, E$$

Where A is the fixed fee, w is the per unit price, I and E refer, respectively, to the incumbent and the entrant firm, while the producers and distributors are denoted by j and k. q_k^j denotes the quantity sold by producer j to the the distributor k. Allowing firms to charge two-part tariffs has the advantage of avoiding double marginalization. We can thus focus exclusively on the effect of exclusive dealing on the entry of new firms, without adding another distortion. We also assume that upstream firms make a take-it-or-leave-it offer to the downstream firms[1]. If there is an exclusive dealing agreement between the incumbent firms, then, in case of entry, the EP can only sell to the ED . When there is no exclusive dealing agreements, each distributor can buy from both producers. We assume the tie-breaking rule that if the input prices charged by the producers are equal, only the lower cost producer sells the input. Producers can price discriminate between the buyers. For example, if the incumbent firms have signed an exclusive dealing agreement, then the IP may want to charge a different two-part-tariff to the ID, from the two-part tariff it charges to the ED, who has also the option of buying from the EP.

The timing of the game is as follows. At time t_1, the IP offers a payment x to the ID if he agrees to sign an exclusive dealing contract. Then, the

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[1]Our main results would still hold if we had assumed linear pricing or downstream firms with bargaining power.

ID decides whether to accept the contract. If a contract is signed it cannot be breached afterwards[2]. At time t_2, the EP decides whether to enter the market after observing if the incumbent firms have signed an exclusive dealing contract. Then, at time t_3, the ED makes the entry decision, after observing if an exclusive dealing contract was signed by the incumbent firms and if there was entry in the upstream market[3]. At time t_4, active firms simultaneously choose their prices (quantities).

We will need the following notation:

- Let π_i denote the net profit of firm i, where $i = IP, EP, ID, ED$.

- Let $\pi_i(a, b)$ denote the profit (gross of fixed fee and entry cost) of the downstream firm i, $i = ID, ED$, when there is competition in the downstream market and the ID faces an input price a and the ED faces an input price b.

- Let $\pi_{ID}(a)$ denote the profit (gross of the fixed fee) of the ID when he is the monopolist in the downstream market and faces an input price a.

We look for sub-game perfect equilibria and examine the impact of the threat of entry in the downstream market. We show that when there is no threat of entry in the downstream market, the incumbent firms don't sign an exclusive dealing agreement and the entrant producer always enters the market whenever that is efficient. By contrast, when there is also the possibility of entry in the downstream market, the incumbent firms may decide to sign an exclusive dealing agreement that prevents the entry of new firms.

This result would be still valid had we assumed that the incumbent producer sells the input to many local monopolists distributors, instead of selling to just a single distributor. However, if the downstream incumbent firms compete against each other, we can apply the Simpson and Wickelgren's result to show that exclusive dealing is possible, even if there is no threat of entry in the downstream market. This is because distributors are forced to pass to their customers part of the benefits of buying from a more efficient seller. However, if producers are allowed to implement resale-price maintenance policies, then Simpson and Wickelgren (2007) is no longer valid. In this case, the incumbent firms can use exclusive dealing agreements to pre-

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[2]Here, it is not relevant if the exclusive contract include or not any commitment to prices since we are assuming that two-part tariffs can be charged.

[3]We could have instead assumed that both entrant firms make simultaneously entry decisions. This would imply that we could obtain an extra equilibrium. In this equilibrium both entrant firms would not enter because each of them expects the other entrant firm to not enter the market.

vent the entry of more efficient producers only when there is also a threat of entry in the downstream market.

To solve the model, we consider first the case where the incumbent firms do not sign an exclusive dealing at time t_1. Then, we consider the case where the incumbent firms sign an exclusive dealing agreement.

2.1 No exclusive dealing

In this section, we look at the case where the incumbent firms do not sign an exclusive dealing agreement at time t_1. The following proposition describes the optimal prices charged by producers.

Proposition 1 [Price decisions at time t_4. No exclusive dealing] *The two-part tariffs chosen by the producers depend on the market structure of the upstream and downstream markets.*

A) If at time t_2 the EP does not enter the market, then the IP sets a two part tariff which depends on the type of competition in the downstream market

     i) If there is a monopoly in the downstream market, the IP chooses the following two-part tariff

$$w_I = c_I \text{ and } A_I = \pi(c_I)$$

     ii) If there is competition in the downstream market, the IP chooses the following two-part tariff

$$w_I = w_I^* > c_I \text{ and } A_I = \pi(w_I^*)$$

B) If at time t_2 the EP enters the upstream market, then only the EP sells the input and its two-part tariff depends on whether the ED enters in the downstream market

     i) If the ED does not enter the market, then the EP's two-part tariff is given by

$$w_E = c_E \text{ and } A_E = \pi(c_I) - \pi(c_E)$$

     ii) If the ED enters the downstream market, then the EP's two-part tariff is given by either

$$w_E = c_I \text{ and } A_E = 0 \tag{1}$$

or

$$w_E = w_E^*, \quad c_E < w_E^* < c_I \text{ and } A_E = \pi_{ED}(w_E, w_E) - \pi_{ED}(w_E, c_I)^4 \tag{2}$$

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[4]Which is equal to $A_E = \pi_{ID}(w_E, w_E) - \pi_{ID}(c_I, w_E)$

where w_I^* is given by condition (18) in the appendix and w_E^* is determined in the same way.

Proof. See appendix ∎

Consider first the case where EP does not enter the market. If there is also a monopoly in the downstream market, then the IP sets the per unit price equal to the marginal cost in order to maximize the industry profit. Then, he captures the industry profit by setting the fixed fee equal to the profit of the ID. If, instead, there is competition in the downstream market, each distributor when he chooses the price does not take into account the externality on the other distributor's profit. Therefore, in order for the distributors to choose prices that maximize the industry profit, the IP needs to set the marginal price of the input above the marginal cost.

Consider now the case where EP enters the market. When there is a monopoly in the downstream market, the EP sets the price per unit equal to the marginal cost and then chooses the fixed fee to leave the ID indifferent between buying from him or buying from the IP. If, instead, there is competition in the downstream market, the EP no longer set its price equal to the marginal cost because that leads to prices below the level that maximize the industry profit[5]. In the appendix, we show that if competition in the downstream market is strong enough and the difference in the marginal cost of the producers is small enough, then the optimal two-part tariff implies $w_E = c_I$. For simplicity, we focus on this case in the remaining part of the paper[6].

At time t_3, the ED decides if it enters the market, after observing whether the EP entered the market at time t_2. The next proposition address the ED's optimal entry decision.

Proposition 2 [Entry decision of the ED at time t_3. No exclusive dealing] *The ED's entry decision at time t_3 depends on the market structure in the upstream market*

A) If at time t_2 the EP does not enter the upstream market, then at time t_3 the ED does not enter the downstream market.

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[5]Since upstream firms sell homogeous imputs, the lower cost entrant producer takes all the market in case of entry. If the competition in the downstream market is strong enough the entrant producer optimal unit price is $w_E = c_I$ and the fixed fee is $A_E^f = 0$.

[6]The main results of the paper are still valid when the two-part tarif is instead given by condition (2).

B) *If at time t_2 the EP enters the upstream market, then at time t_3 the ED enters the downstream market if*

$$\pi_{ED}(c_I, c_I) \geq E_D$$

Proof. See Appendix. ∎

When the EP enters the market, the stronger competition in the upstream market decreases the market power of the producers and makes entry in the downstream market more likely.

Next, we examine the EP's decision of whether to enter the upstream market at time t_2. To make this decision the EP takes into account what he expects the ED will do in the following period.

Proposition 3 *[Entry Decision of the EP at time t_2. No exclusive dealing]*

i) *If $\pi_{ED}(c_I, c_I) < E_D$, then the EP enters the market if*

$$\pi_{EP} = \pi(c_E) - \pi(c_I) \geq E_P \tag{3}$$

ii) *If $\pi_{ED}(c_I, c_I) \geq E_D$, then the EP enters the market if*

$$\pi_{EP} = 2(c_I - c_E)D_i(c_I, c_I) \geq E_P \tag{4}$$

In case i), if condition (3) holds, the profits of the producers are $\pi_{IP} = 0$ and $\pi_{EP} = \pi(c_E) - \pi(c_I)$. The profits of the distributors are $\pi_{ED} = 0$ and $\pi_{ID} = \pi(c_I)$. If condition (3) does not hold, the profits are $\pi_{IP} = \pi(c_I)$ and $\pi_{EP} = \pi_{ID} = \pi_{ED} = 0$.

In case ii), if condition (4) holds, the profits of the producers are $\pi_{IP} = 0$ and $\pi_{EP} = (c_I - c_E)2D(c_I, c_I)$. The profits of the distributors are $\pi_{ID} = \pi_{ID}(c_I, c_I)$ and $\pi_{ED} = \pi_{ED}(c_I, c_I)$. If condition (4) does not hold, the profits are $\pi_{IP} = \pi(c_I)$ and $\pi_{EP} = \pi_{ID} = \pi_{ED} = 0$.

where $D_i(a, b)$ denotes the equilibrium demand of distributor firm i, $i = ID, ED$, when the distributors, ID and ED, face, respectively, the input prices a and b and maximize their profits

Proof. This proposition follows directly from propositions 1 and 2. ∎

If $\pi_{ED}(c_I, c_I) < E_D$, then the ED does not enter the market even if the EP enters the market. This implies that the EP only enters the market if

its profit, when he faces a monopoly in the downstream market, is higher than its entry costs. If, instead, $\pi_{ED}(c_I, c_I) \geq E_D$, then the ED enters the market if the EP also enters the market. Hence, the EP enters the market if the profit, when he faces competition in the downstream market, is higher than the entry cost. The EP is more likely to enter when there is also entry in the downstream market. In this case, the EP's profits are higher because the higher competition between the distributors leads to a higher quantity being sold for the same input price.

2.2 Exclusive Dealing

In this section, we consider the case where the incumbent firms sign an exclusive dealing at time t_1. Exclusive dealing agreements change the results of the previous section only when there is entry in the upstream market. Hence, in this section we only examine this case.

Proposition 4 *[**Price decisions at time** t_4. **Exclusive dealing**] If the incumbent firms sign an exclusive dealing agreement and the EP enters the upstream market at time t_2, then the producers' optimal prices depend on whether the ED enters the market at time t_3*

A) If the ED does not enter the downstream market, then the EP does not sell the input and the IP's two-part tariff is

$$w_I = c_I \ and \ A_I = \pi(c_I)$$

B) If the ED enters the downstream market, in equilibrium the IP sells to the ID, while the EP sells to the EP. The IP's two-part tariff is

$$w_I = c_I \ and \ A_E = \pi_{ID}(c_I, c_E)$$

The EP's two-part tariff is

$$w_E = c_E \ and \ A_E = \pi_{ED}(c_I, c_E) - \pi_{ED}(c_I, c_I)$$

Proof. See appendix. ∎

Notice that, despite having signed an exclusive dealing agreement, the IP still finds it optimal to charge the ID a unit price equal to its marginal cost.

This is because it can capture the profits of the ID through the fixed fee. The lower cost EP sells only to the ED. It charges the ED a price equal to the marginal cost, $w_E = c_E$. Since the ED can alternatively buy the input from the IP at $w_I = c_I$, the fixed fee charged by the EP leaves the ED indifferent between buying from the two upstream firms.

At time t_3, the ED decides whether to enter the market after observing if the EP has entered the market at t_2.

Proposition 5 [Entry decision of the ED at time t_3. Exclusive dealing] *If the incumbent firms sign an exclusive dealing agreement and the EP enters the upstream market, then, at time t_3, the ED enters the downstream market if and only if*

$$\pi_{ED}(c_I, c_I) \geq E_d$$

Proof. This follows directly from proposition 4. ∎

Notice that, assuming the EP has entered the market, propositions 2 and 4 imply that the decision of the ED of whether to enter the market is not affected by the existence of an exclusive dealing agreement between the incumbent firms. Therefore, the exclusive dealing agreement only affects the ED's entry decision through the impact it might have on the EP's decision to enter the upstream market.

Finally, at time t_2, the entrant producer realizes that if it enters the market, then he can only sell the input to the ED.

Proposition 6 [Entry decision of the EP at time t_2. Exclusive dealing] *If an exclusive dealing agreement is signed by the incumbent firms, then the EP enters the market if and only if the following two conditions hold*

$$\pi_{ED}(c_I, c_I) \quad \geq \quad E_D \qquad (5)$$
$$\pi_{ED}(c_I, c_E) - \pi_{ED}(c_I, c_I) \quad \geq \quad E_U \qquad (6)$$

If conditions (5) and (6) hold, the profits of the producers are $\pi_{IP} = 0$ and $\pi_{EP} = \pi_{ED}(c_I, c_E) - \pi_{ED}(c_I, c_I)$ and the profits of the distributors are $\pi_{ED} = \pi_{ID} = \pi_{ED}(c_I, c_I)$. If one of the conditions (5) and (6) does not hold, the profits are $\pi_{IP} = \pi_{ID}(c_I) - \pi_{ID}(c_I, c_I)$, $\pi_{ID} = \pi_{ID}(c_I, c_I)$ and $\pi_{EP} = \pi_{ED} = 0$.

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Proof. This follows directly from proposition 4 and 5. ∎

Condition (5) guarantees that the ED enters the market at time t_3 if the EP also enters the market at time t_2. Condition (6) guarantees that the EP enters the market if he expects that the ED also enters. In this case, the EP enters the market if the joint profit of the entrant firms less the profit obtained by the ED is higher than the entry cost of the EP.

Notice that the EP and the ED benefit from each other entering the market. It can happen that the sum of the profits of the entrant firms is higher than the sum of their entry costs and none of the entrant firms enters the market because one of them has profit lower than the entry costs. We consider next the case where the entrant firms are allowed to subsidize each other's entry. We assume that at time t_2 before EP decided to enter the market, each entrant firm can offer the other a payment in case it enters the market.

Proposition 7 *If the incumbent firms sign an exclusive dealing agreement and the entrant firms can subsidize each other's entry, then the entrant firms enter the market if and only if*

$$\pi_{ED}(c_I, c_E) \geq E_U + E_D$$

Proof. This follows directly from perfect information about entry costs. ∎

2.3 Incumbent Firms' Decision to Sign an Exclusive Dealing Contract

We now consider the incumbent firms' decision of whether to sign an exclusive dealing agreement at time t_1. The IP can offer an amount x to the ID if he agrees to sign an exclusive dealing contract. There are two different cases to consider under free competition. First, the EP enters the market but the ED does not enter the market. Second, both firms enter the market. In this case, the entry in the upstream market leads to further entry in the downstream market[7]. We show that while in the first case incumbent firms don't sign an exclusive dealing agreement, in the second case they might

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[7]Notice that ED never enters in the market at time t_3 when EP does not enter the market at time t_2

sign an exclusive dealing agreement if it prevents the entry. Hence, exclusive dealing agreements are only used when there is a threat of entry both in the upstream and in the downstream market.

The next proposition considers the case where there is no threat of entry in the downstream market.

Proposition 8 *[**No exclusive dealing**] If the following two conditions hold*

$$i)\ \pi_{ED}\ =\ \pi_{ED}(c_I, c_I) < E_D \qquad (7)$$
$$ii)\ \pi_{EP}\ =\ \pi(c_E) - \pi(c_I) \geq E_P$$

then the incumbent firms don't sign an exclusive dealing agreement. The EP enters the market and the ED does not enter the market.

Proof. Under the conditions of this proposition, we can apply proposition 2 to show that the ED does not enter the downstream market, while proposition 3 implies that the EP enters in the upstream market if no exclusive dealing agreement is signed. In this case, the profits of the incumbent firms are

$$\pi_{IP} = 0 \text{ and } \pi_{ID} = \pi(c_I)$$

If the incumbent firms sign an exclusive dealing agreement, then, by proposition 6, the EP does not enter the market at time t$_2$. In this case, the profit of the incumbent firms are

$$\pi_{IP} = \pi_{ID}(c_I) \text{ and } \pi_{ID} = 0$$

Notice that the joint profit of the incumbent firms is the same in both cases. The maxim amount x the IP is willing to offer to the ID if he signs an exclusive dealing agreement, $\pi(c_I)$, is equal to the increase in the ID's profit when there is entry in the upstream market. Here, we assume the tie-breaking rule that if $x = \pi(c_I)$, the ID decides not to accept the exclusive dealing agreement. This tie-breaking rule is the reasonable assumption here because we have also assumed the tie-braking rule that if the producers two-part tariffs provide the same surplus to the distributor, he opts for the lower cost producer. Had we not assume this tie-breaking rule, the lowest cost producer would always be willing to make an offer that is slightly better than the other producer. ∎

We conclude that if there is no threat of entry in the downstream market, then incumbent firms do not sign exclusive dealing agreements. Intuitively,

in order to induce the ID to sign an exclusive dealing agreement, the IP has to compensate him for the loss he suffers from not buying from a more efficient producer. However, since the loss suffered by the IP in case of entry is smaller than the gain of the ID, the incumbent firms don't sign an exclusive dealing agreement.

If renegotiation was allowed, the incumbent firms would sign an exclusive dealing contract in order to extract surplus from the EP. This contract would have a penalty of breaching it equal to the EP net profits. Thus, the entrant producer would always enter the market and would have zero profits. This is the result obtained by Aghion and Bolton (87) for the case with no uncertainty about the entrant costs.

We now show that if there is a threat of entry in both markets, then the incumbent firms may want to sign an exclusive dealing agreement.

Proposition 9 *[**No exclusive dealing**] The incumbent firms sign an exclusive dealing agreement that prevents the entry of the new firms if and only if the following conditions hold*

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\begin{aligned}
\pi_{ED} &= \pi_{ED}(c_I, c_I) \geq E_D \\
\pi_{EP} &= 2(c_I - c_E)D(c_I, c_I) \geq E_P \\
\pi_{EP} &= \pi_{ED}(c_I, c_E) - \pi_{ED}(c_I, c_I) < E_P
\end{aligned}
$$

Under these conditions, the IP offers the ID an amount $x = \pi_{ID}(c_I, c_I)$ to sign an exclusive dealing agreement.

Proof. By proposition 2 and 3 part ii) both entrant firms enter the market if the incumbent firms don't sign an exclusive dealing agreement. In this case, the profit of incumbent firms are

$$\pi_{IP} = 0 \text{ and } \pi_{ID} = \pi_{ID}(c_I, c_I)$$

If the incumbent firms sign an exclusive dealing agreement, then by proposition 5 and 6 both entrant firms stay out of the market. The profits of the incumbent firms profits are

$$\pi_{IP} = \pi(c_I) \text{ and } \pi_{ID} = 0$$

Since we must have that[8]

$$\pi(c_I) > \pi_{ID}(c_I, c_I)$$

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[8]Firms are assume to compete a la Cournot or compete in prices with differentiated and substitute goods.

the IP is willing to offer an amount $x = \pi_{ID}(c_I, c_I)$ to the ID if it signs an exclusive dealing contract. ∎

Entry of a more efficient producer and the increasing competition in the upstream market, implies that upstream firms are not able to extract as much surplus from downstream firms. The main difference between propositions 8 and 9, is that, in the second case, increasing competition in the upstream market also leads to entry in the downstream market. This implies that entry of a more efficient producer no longer increases the joint profits of the incumbent firms. Now part of the bigger surplus created by the entry of a more efficient entrant producer is captured by the entrant distributor and by the consumers through the increasing competition in the downstream market.

Next, we look at one condition that guarantees that incumbent firms sign an exclusive dealing agreement for some level of the fixed costs.

Proposition 10 *There is a non-empty set of entry costs, E_P and E_D, that leads the incumbent firms to sign an exclusive dealing agreement if and only if the following condition holds*

$$\pi_{ED}(c_I, c_E) < \pi_{ED}(c_I, c_I) + 2(c_I - c_E)D(c_I, c_I) \tag{8}$$

Proof. See appendix ∎

Proposition 10 means that if the joint profits of the entrant firms under exclusive dealing are lower than the sum of their profits under free market, then the three conditions of proposition 9 can be satisfied for some level of the entry costs. Hence, this condition guarantees that for some level of the entry costs, the incumbent firms want to sign an exclusive dealing agreement.

If we assume that the entrant firms can subsidize each other entry, then we can be more specific about the conditions that lead to exclusive dealing.

Proposition 11 *If the entrant firms are allowed to subsidize each other entry, then the incumbent firms sign an exclusive dealing agreement if and only if the following two conditions hold*

$$\pi_{ED}(c_I, c_E) < E_U + E_D \leq \pi_{ED}(c_I, c_I) + 2(c_I - c_E)D(c_I, c_I) \tag{9}$$
$$E_D \leq \pi_{ED}(c_I, c_I) + 2(c_I - c_E)D(c_I, c_I) - \pi(c_E) + \pi(c_I) \tag{10}$$

Proof. See appendix. ∎

Condition (9) means that the sum of the entry costs is higher than the sum of their profits under exclusive dealing but lower than the joint profits obtained under free market. Condition (10) guarantees that ED also enters the market under no exclusive dealing when firms can subsidize each other entry.

We have seen that the necessary condition for exclusive dealing is that the sum of the entrant firms' profits are higher under free market than under exclusive dealing. However, while this is in general the case, this is not always true and depends on the type of competition in the downstream market. There are two factors that have opposite effects on the joint profit of the entrant firms when we move from exclusive dealing to free market:

i) In a free market, the EP can also sell to the ID. This tends to increase the joint profit of the entrant firms under free market.

ii) Under exclusive dealing the EP charges the ED a unit price equal to its marginal cost. However, under free market the EP sells to both firms and charges them a price higher than its marginal cost, $w_E > c_E$. Therefore, the ED faces an input price higher than the marginal cost of the EP. This has a direct negative effect on the joint profit of the entrant firms. Furthermore, if the downstream firms compete in quantities this also has a negative strategic effect, since quantities are strategic substitutes. Hence, in this case, the overall impact of charging $w > c_E$ is negative. However, if downstream firms compete in prices, the strategic effect is positive. In this case, this overall effect can be either positive or negative.

Due to this trade-off, unless we specify the demand function and the type of competition in the downstream market, we cannot determine exactly when the conditions of propositions 10 and 11 hold. For this reason, in the next section we consider the case where firms compete in quantities in the downstream market. Then, in section 4, we look at a standard model of price competition.

3 Quantity Competition in the Downstream Market

In this section, we consider that firms compete in quantities in the downstream market. To simplify, we assume that in the downstream market the

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inverse demand function is linear and given by

$$p = 1 - Q$$
$$Q = q_I + q_E$$

where q_I and q_E are, respectively, the quantities offered in the downstream market by the ID and the ED. We first consider the case where the incumbent firms do not sign an exclusive dealing agreement. Then, we examine the case of exclusive dealing.

No Exclusive Dealing Consider first that incumbent firms have not signed an exclusive dealing agreement and both entrant firms enter the market. Then, assuming the difference in the marginal costs of the upstream firms is small enough, proposition 3 implies that the EP charges an input price equal to the marginal cost of the IP, $w_E = c_I{}^9$.

The quantity sold by each downstream firm is

$$q = \frac{1 - c_I}{3}$$

The final price of the good is

$$p = \frac{1 + 2c_I}{3}$$

The EP takes all the market and obtains a profit of

$$\pi_{EP} = \frac{2}{3}(1 - c_I)(c_I - c_E)$$

The profit of each downstream firms is

$$\pi_{ID} = \pi_{ED} = \frac{1}{9}(1 - c_I)^2$$

Exclusive Dealing Consider now that the incumbent firms sign an exclusive dealing agreement and both entrant firms enter the market. Proposition 4 part ii) implies that IP sells to ID and EP sells to ED. It also

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[9]We verify this condition in the end of this section.

implies that both producers charge an input price equal to their marginal cost, $w_I = c_I$ and $w_E = c_E$.

The quantity sold by the incumbent firms and the entrant firms is respectively

$$q_I = \frac{1 - 2c_I + c_E}{3}, \qquad q_E = \frac{1 - 2c_E + c_I}{3}$$

The joint profit of the incumbent firms and of the entrant firms are

$$\pi_I^{ex} = \frac{(1 - 2c_I + c_E)^2}{9}, \qquad \pi_E^{ex} = \frac{(1 - 2c_E + c_I)^2}{9}$$

Proposition 10 says that the set of entry costs, E_U and E_U, that leads to exclusive dealing is not empty if

$$\pi_E^{ex} < \pi_{EP} + \pi_{ED}$$

Which is equivalent to

$$\frac{(1 - 2c_E + c_I)^2}{9} < \frac{2}{3}(1 - c_I)(c_I - c_E) + \frac{1}{9}(1 - c_I)^2$$

This simplifies to

$$c_E < c_I < \frac{2}{3}c_E + \frac{1}{3} \tag{11}$$

Condition (11) also guarantees that the IP's optimal input price is $w_E = c_I$, as we have assumed at the beginning of this section.

We conclude that if downstream firms compete in quantities and the demand function is linear, then exclusive dealing might be used to deter the entry of new firms. In order to have exclusive dealing the EP needs to be more efficient than the IP, but not much more efficient. Notice that the joint profit of the incumbent firms when they prevent the entry of the entrant firms is higher than when there is no exclusive dealing and the entrant firms enter the market

$$\pi_I^{ex} = \pi_{ID}(c_I) = \frac{1}{4}(1 - c_I)^2 > \pi_{ID}(c_I, c_I) = \frac{1}{9}(1 - c_I)^2$$

4 Price Competition in the Downstream Market

In this section, we consider that downstream firms compete in prices. We assume a linear city model where consumers have unit demands and are uniformly distributed along a segment of length one. Consumers are assumed to have linear transportation costs of t per unit of length. The ID is located at $x = 0$, while the ED, in case it enters the market, is located t $x = 1$. A consumer located at x, derives the following surplus of buying from the ID

$$V - p_I - tx$$

Where V is the consumer surplus gross of price and transportation costs.

We assume that there is actual competition in the downstream market in case of entry. For that we need to impose the following condition

$$t < v - c_I$$

No Exclusive Dealing To verify if condition (8) holds (the necessary condition for exclusive dealing), we start by computing the joint profits of the entrant firms in case of no exclusive dealing. Notice that, in this case, the optimal two-part tariff part charged by the EP is given by

$$w_E = c_I \text{ and } A_E = 0$$

The EP has demand equal to 1 and its profit is

$$\pi_{EP} = c_I - c_E \tag{12}$$

The profit of the entrant distributor is given by

$$\pi_{ED} = \frac{t}{2} \tag{13}$$

Hence, the joint profits of the entrant firms with no exclusive dealing is

$$c_I - c_E + \frac{t}{2} \tag{14}$$

Exclusive Dealing Consider now the case where incumbent firms sign an exclusive dealing agreement. Proposition 4 implies that in equilibrium

the IP sells to the ID while the EP sells to the ED. Producers charge the following marginal prices

$$w_I = c_I \text{ and } w_E = c_E$$

The joint profit of the entrant firms with exclusive dealing is

$$
\begin{aligned}
\pi_{ED}(c_I, c_E) &= \frac{t}{2} + \frac{c_I - c_E}{3} + \frac{(c_I - c_E)^2}{18t} \quad \text{if } t \geq \frac{c_I - c_E}{3} \qquad (15) \\
\pi_{ED}(c_I, c_E) &= c_I - c_E - t \quad \text{if } t < \frac{c_I - c_E}{3}
\end{aligned}
$$

Looking at expressions (14) and (15) we conclude that, unless t=0, the joint profit of the entrant firms under exclusive dealing is always lower than their joint profit under free market. Therefore, if there is product differentiation in the downstream market, then there is always a non-empty set of entry costs, E_U and E_D, such that the incumbent firms can sign an exclusive dealing agreement to prevent the entry of the more efficient rival producer.

Notice that, as the degree of product differentiation increases, the difference between the joint profit of the entrant firms under free market and their joint profit under exclusive dealing also increases. Hence, assuming entrant firms are allowed to subsidize each other entry, proposition 11 implies that the interval of the sum of the entry costs that guarantees the use of exclusive dealing becomes bigger. We can also easily check that, as t increases, condition (10) also becomes more easily satisfied. Therefore, we can conclude that exclusive dealing becomes more likely as the degree of product differentiation increases.

However, if the degree of product differentiation is high enough so that in case of entry the downstream firms do not compete against each other and become local monopolists, then the incumbent firms do not use exclusive dealing agreements. In this case, the reason they don't sign exclusive dealing agreements is not that these agreements are not effective, but instead because the entry of the new firms no longer decreases the joint profits of the incumbent firms. This is because the entrant distributor is no longer competing with the incumbent distributor.

5 Conclusion

In this paper, we argue that the entry in upstream market of a more efficient producer, by increasing the competition among upstream firms and reducing

their market power, might lead to further entry in the downstream market. In this case, the entry of a more efficient producer no longer necessarily increases the joint profits of the incumbent firms. This is because part of the bigger surplus created by the more efficient upstream firm is now appropriated by the entrant distributor and by the consumers, due to the increase in competition in the downstream market. Therefore, the incumbent firms may sign an exclusive dealing agreement to prevent the entry of the new firms.

We provide general conditions for the incumbent firms to use exclusive dealing agreements as a mechanism to prevent the entry of rival firms. Then, we looked at two different types of competition in the downstream market. When downstream firms compete in quantities, incumbent firms may sign exclusive dealing agreements if the cost advantage of the entrant producer is neither very small nor very big. If, instead, firms compete in prices in a linear city model, incumbent firms may want to use exclusive dealing agreements whatever the degree of product differentiation. Furthermore, exclusion becomes more likely as the product differentiation increases.

Appendix

Proof of proposition 1

We prove proposition 1 for the case where downstream firms compete in prices. The proof for the case where firms compete in quantities is similar.

A i) See Tirole (1988) page 176.

ii) Consider first the non-integrated structure, with the incumbent producer and two independent downstream firms. Retailer i maximizes

$$\max_{p_i} \ (p_i - w_I) * q_i(p_i, p_j)$$

where p_i and p_j denote the prices of firm i and firm j and $q_i(p_i, p_j)$ denotes the demand of firm i given prices p_i and p_j, with $i = ID, ED$, $j = ID, ED$, and $i \neq j$.

The first order condition of retailer i, $i = ID, ED$, is

$$q_i(p_i, p_j) + \ (p_i - w_I) * \frac{\partial q_i(p_i, p_j)}{\partial p_i} = 0 \qquad (16)$$

Consider now the profit maximization problem of the integrated structure

$$\max_{p_i, \ p_j}(p_i - c_I) * q_i(p_i, p_j) + (p_j - c_I) * q_j(p_i, p_j)$$

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The first order condition in order to p_i, $i = ID, ED$, is

$$q_i(p_i, p_j) + (p_i - c_I) * \frac{\partial q_i(p_i, p_j)}{\partial p_i} + (p_j - c_I) * \frac{\partial q_j(p_i, p_j)}{\partial p_i} = 0 \qquad (17)$$

We assume that the good are substitutes, $\frac{\partial q_j(p_i, p_j)}{\partial p_i} < 0$. If, in the case of the non-integrated structure, the producer chooses $w = c$. Then, the prices that satisfy the two conditions given by (16), one for each firm, are lower than the prices that satisfy the two equations given by condition (17), one for the price of each good. Notice that the prices given by condition (16) increase with w. Hence, to make the downstream firms choose the prices that maximize the industry profit, we need $w > c$. From conditions (16) and (17) we obtain that the optimal input price is

$$w_I^* = c - \frac{(p^* - c_I) * \frac{\partial q_j(p^*, p^*)}{\partial p_i}}{\frac{\partial q_i(p^*, p^*)}{\partial p_i}} \qquad (18)$$

Where p^* is the solution of the system of two equation given by condition (17)

B) i) Given the two-part tariff charged by the entrant firm, $w_E = c_E$ and $A_E = \pi(c_I) - \pi(c_E)$, we have that $\pi_{ID} = \pi(c_I)$. The IP cannot offer the ID any profitable two-part tariff that increases the ID payoff. Assume that IP offers the following two-part tariff $w_I = c_I$ and $A_I = 0$. Given this, the EP also does not want to deviate. It chooses the fixed fee such that the ID's payoff is $\pi(c_I)$. Then, following Tirole (1998) he sets $w_E = c_E$ to maximize the industry profit.

ii) We can determine the two equations given by a condition equivalent to condition (17) for the case of the entry firm, where c_I is replaced by c_E. These equations determine the input price that leads the competing down-stream firms to choose prices that maximize the industry profit. Consider first that the solution of these equations given by condition (17) is $w_E^* < c_I$. Then, in equilibrium, the EP chooses the marginal price w_E^* and each down-stream firm obtains a gross profit of $\pi_{ED}(w_E^*, w_E^*)$. The equilibrium fixed fee, given by condition (2), leaves each downstream firm indifferent between buying from the EP and the IP. The equilibrium profit of each downstream firm is $\pi_{ED}(w_E^*, c_I)$. Assume that the IP offers a two-part tariff with $w_I = c_I$ and $A_I = 0$. The downstream firms don't want to deviate and buy from the IP, because they obtain the same profit of $\pi_{ED}(w_E^*, c_I)$. IP does not want to

deviate because the only two-part-tariffs that downstream firms would accept would leave him with negative profits. Consider now that $w_E^* > c_I$. This is not an equilibrium since the IP can offer $w_I = c_I$ and $A_I = 0$ and the downstream firms would prefer to buy from the IP. Hence, we have that $w_E^* = c_I$ and $A_E = 0$. Notice if we allow the EP to sign an exclusive dealing with the downstream firms, then we could sustain $w_E^* > c_I$ in equilibrium. However, this would not change the qualitative results obtained in this paper.

Proof of proposition 2

A) Part A of the proposition follows directly from proposition 1. If the IP is a monopolist in the upstream market, then it charges each distributor a fixed fee equal to the distributor's gross profit. Hence, distributors have zero net profits and thus the ED does not enter the market.

B) If the EP enters in the market, by proposition 1, $\pi_{ED} = \pi_{ED}(c_I, c_I)$. Hence ED enters the market if $\pi_{ED}(c_I, c_I) \geq E_D$.

Proof of proposition 4

A) Given the exclusive dealing agreement signed between the IP and the ID, the ID cannot buy from the EP. This implies that IP can charge a fixed fee that leaves the ID indifferent between buying and not buying. If the ED does not enter, the ID is a monopolist distributor. Following Tirole (1988) page 176, the two-part tariff that maximizes the IP's profit is $w_I = c_I$ and $A_I = \pi(c_I)$.

B) If the ED enters the market, then there is a duopoly in the downstream market. Given the exclusive dealing agreement, IP chooses a two-part tariff that leaves the ID indifferent between buying and not buying. Hence, in this equilibrium we must have that $A_I = \pi_{ID}(w_I, w_E)$. Once again, following Tirole (1988) page 176, the two part tariff that maximizes the IP profit is $w_I = c_I$ and $A_I = \pi_{ID}(c_I, w_E)$. The ED can buy from both firms. Following Tirole (1988) page 176, the EP chooses $w_E = c_E$. We can also see that if $A_E = \pi_{ED}(c_I, c_E) - \pi_{ED}(c_I, c_I)$, then the ED would be indifferent between accepting this offer and buying from the IP at $w_I = c_I$ and $A_I = 0$. Notice that each producer's two-part tariff is a best response to the other producer's two-part tariff.

Proof of proposition 11

By proposition 7, the second inequality in condition (9) implies that if there is an exclusive dealing agreement, the entrant firms do not enter the market. Condition (10) implies that under free market the ED enters the market if the EP also enters the market, since its profit plus what the EP is willing to subsidize ED for entering the market is higher than ED's entry costs. The first inequality in expression (9) together with condition (10) guarantees that they enter the market with no exclusive dealing.

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