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ABSTRACT

Exclusive Dealing and Entry when Buyers Compete*

Rasmusen *et al.* (1991) and Segal and Whinston (2000) show that an incumbent monopolist might exclude entry of a more efficient competitor, by exploiting externalities among buyers. We show that their results hold only when downstream competition among buyers does not exist or is weak enough. Under fierce downstream competition, the incumbent cannot compensate a deviant buyer who buys from the more efficient entrant. Any such buyer will become more competitive and increase their output – thus triggering entry – and profits at the expense of buyers who sign an exclusive deal with the incumbent. Hence, exclusive deals cannot deter efficient entry.

JEL Classification: K21, L12 and L42
Keywords: anticompetitive behaviour, buyers' coordination and foreclosure

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1 Introduction

For a long time, economists have been skeptical about the possibility that exclusive contracts could be used to deter entry of a more efficient seller. This view is well summarised by the influential works of Posner (1976) and Bork (1978). They argue that, in order to induce a buyer to sign an exclusive deal, the incumbent should fully compensate her of the loss she suffers from not buying from a more efficient entrant.[1] Since this loss is higher than the profit the monopolist would make if entry is deterred, it follows that the incumbent would not find it profitable to foreclose entry. Hence, efficiency considerations, rather than anticompetitive motives, will explain the use of exclusive contracts.

Since the early Eighties a number of game theoretic models have studied the rationale for anti-competitive exclusive contracts. Aghion and Bolton (1986) illustrate how an incumbent and a buyer might agree on a contract which enables them to extract some of the rent the entrant would gain in case of entry. Exclusion does not always occur, but when it does it is anticompetitive. In Rasmusen et al. (1991), subsequently refined by Segal and Whinston (1996, 2000) - see below for a less cursory description - the entrant needs to supply a minimum number of buyers to cover its fixed costs. Therefore, a buyer's decision to accept an exclusive deal from the incumbent imposes an externality on the other buyers. By exploiting this externality among (uncoordinated) buyers, the incumbent is able to deter entry. In Bernheim and Whinston (1998), in addition to an existing market a second market will develop over time. If entry is viable only by serving both markets, an exclusive deal with the buyer in the existing market might pre-empt entry in the second market.

A common feature of all these papers is that the exclusive contract between the incumbent and a buyer has some type of externality on (one or more) third parties. Indeed, Bernheim and Whinston (1998) show in a more general way that it is the exploitation of this externality that makes an exclusive deal profitable.

However, these papers assume that buyers are final consumers (or firms which sell in independent markets). In this paper, we show that considering downstream competition among buyers provides new insights. When buyers are competitors in the retail market, acquiring an input at lower cost gives one buyer a competitive advantage vis-à-vis rivals: she will have a larger market share and higher profits than buyers who purchase from the incumbent (whereas when buyers sell in independent markets, or are final consumers, their demand for the input and their payoff will not depend on the cost of other buyers). As a result, the incumbent will have to give a higher compensation to each buyer to induce her to accept the exclusive deal. If competition is strong enough, the incumbent might not find it profitable to induce the buyers to sign the deal. In a way, downstream competition among buyers introduces an additional externality which makes it more difficult, rather than easier, for the incumbent to induce them to sign an exclusive contract.

[1] This loss amounts to the difference between the consumer surplus under entry and the consumer surplus under monopoly, an area which equals the monopoly profit plus the monopoly deadweight loss.

Therefore, our results imply that the potential for using exclusive contracts in an anti-competitive way depends on the structure and characteristics of the downstream markets.

We believe that downstream competition affects the analysis of entry deterrence effects of exclusive dealing in other models as well, but we start by exploring this issue in the context of the models by Rasmusen et al. (1991) and Segal and Whinston (1996, 2000), where exclusive dealing is extremely powerful in deterring entry. We are currently work to extend our results to other models where exclusive dealing have anti-competitive effects.

The next section 2 studies how competition among final buyers changes their analysis and results in a general model. An appendix studies two parametric examples that satisfy the assumptions made in the general model.

2 Exclusive dealing and buyers' fragmentation, when buyers compete

Rasmusen et al. (1991) and Segal and Whinston (1996, 2000) show that an incumbent monopolist may profitably deter efficient entry by offering exclusive contracts to *uncoordinated* buyers. A crucial assumption in these works is that the entrant's minimum viable scale is large relative to the industry demand so that entry is profitable only if the entrant sells to a minimum number of buyers (higher than one). This creates the scope for entry deterrence: by signing the exclusive contract a buyer makes it more difficult for the entrant to achieve its minimum viable scale, thus imposing an externality on the other buyers. This externality is exploited by the incumbent through different mechanisms. When exclusive contracts are offered simultaneously and are constrained to be non-discriminatory, the incumbent relies on the buyers' coordination failure. When offers can be discriminatory, it is easier for the incumbent to put one buyer against the others and it can exclude even in the absence of the coordination failure. The externality among buyers is further exacerbated when offers are sequential.

Rasmusen et al. (1991) and Segal and Whinston (1996, 2000) assume that buyers are final consumers. We extend their model by considering buyers who use the input bought either from the potential entrant or from the incumbent to (transform it and) resell it in a final market. Our finding is that the nature of downstream competition affects the externality that a buyer imposes on the others by accepting an exclusive deal, thereby affecting the scope for entry deterrence. To see the intuition, suppose that buyers sell very close substitutes in the downstream market and compete in prices. Suppose also that a potential entrant is more efficient than the incumbent. In this case, buying a cheaper input than rivals provides a buyer with a strong competitive advantage. Indeed, the buyer that purchases a cheaper input would have a lower marginal cost than rivals and would hence be able to capture most of the downstream market. Hence, the input demand of a single buyer suffices to make entry profitable. This prevents the incumbent from exploiting buyers' fragmentation to exclude (i.e. it would be impossible for the incumbent to induce buyers to accept an exclusive deal). At the other extreme, suppose that downstream sellers produce goods so differentiated that their markets are almost independent. In this case, obtaining the input at a lower price than other buyers does not allow to steal much of their business. Therefore, being the only buyer to address the entrant would not determine a large enough input demand so as to make entry profitable. This case is therefore similar to the model analysed by Segal and Whinston (1996, 2000).

In what follows, we formalise the argument just described. Section 2.1 presents the model and investigates the role of downstream competition when offers are simultaneous and non-discriminatory. Section 2.2 studies the case of discriminatory offers. Sequential offers are considered in Section 2.3.

2.1 Simultaneous and non-discriminatory offers

Segal and Whinston (1996, 2000) show that, when the incumbent simultaneously offers *uniform* contracts to all the buyers, it may prevent efficient entry by exploiting the latter's *coordination failure*. Why do buyers sign these contracts since they end up with having the incumbent as the only seller in the industry and pay a higher price for the good than if entry occurred? The reason is that if all the buyers sign the exclusive contract, no one has incentive to deviate. By refusing to sign, a single buyer would not trigger entry and would have to buy the good from the incumbent anyway, at a higher price. The deviation is not profitable and all the buyers signing the exclusive contract is an equilibrium. (There is also another equilibrium, where all buyers reject the contract and buy from the entrant).

We prove in this Section that tough enough downstream competition will break this "exclusion equilibrium", since a deviation would be accompanied by a large order which would trigger entry. We keep Segal and Whinston (1996)'s setting and we introduce some additional assumptions in order to deal with the case of buyers competing in the downstream market.[2]

2.1.1 The model

We consider a market where an incumbent firm (I) produces a good at a constant marginal cost c_I. The good is used by two buyers[3] as an input to produce a final good sold in a downstream market. (We assume for simplicity that there is a one-to-one relationship between the input bought by the buyer and the output sold in the final market, and that the cost of transformation or resale for downstream buyers is zero.) A potential rival (E), which has lower marginal cost than the incumbent $(c_E < c_I)$, is willing to enter the market. To do it, it will have to pay the fixed sunk cost F.[4]

The timing of the game is as follows (see also Figure 1). At time t_0 the incumbent simultaneously offers buyers exclusive contracts (i.e. contracts that commit buyers to purchase only from it). Buyers

[2] The assumptions we make are satisfied for many models. In particular, as illustrated in the Appendix, they hold for the linear demand class of functions proposed by Shubik and Levitan (1980).

[3] For simplicity we consider the two-buyers case. All the results can be extended to the more general case with N buyers.

[4] Rasmusen et al. (1991) and Segal and Whinston (2000) assume that the entrant and the incumbent are characterised by the same average cost function, which is decreasing up to a threshold level of production. For higher production levels, average costs are constant. Instead, we adopt the same cost structure as in Segal and Whinston (1996) under which the same results as in Segal and Whinston (2000) are obtained. In our view this formulation is neater.

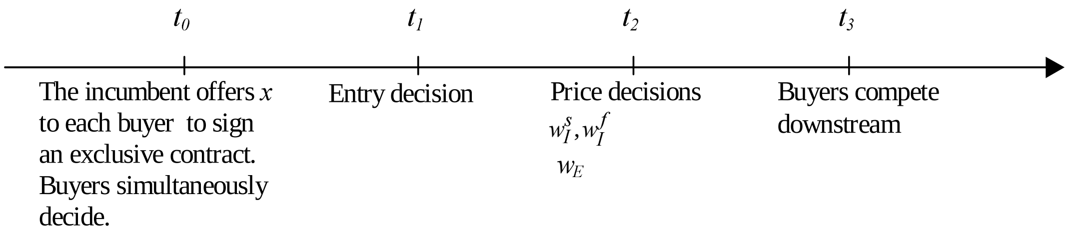

Figure 1: *Time-line.*

simultaneously decide whether to accept or not. S denotes the number of buyers who accept the exclusive contract. To sign the contract, each buyer is offered a compensation x. In this Section, we focus on the case where the incumbent makes a single (non-discriminatory) offer to all buyers. The exclusive contract does not include any commitment on prices.[5] At time t_1 the entrant decides on entry. At time t_2 active firms simultaneously name input prices. The incumbent is able to discriminate between those buyers who have signed the exclusive contract, who are offered a unit price w_I^s, and those who have not (free buyers), who are offered a price w_I^f. The potential entrant, if it has entered, can make offers only to free buyers. It offers a price w_E.[6] At time t_3 buyers compete in the final market. We do not adopt a particular demand function[7] nor do we need to specify whether buyers choose prices or quantities. We simply assume that the toughness of competition in the downstream market is captured by the parameter $\gamma \in [0, \overline{\gamma})$. This parameter can be interpreted as a measure of the (symmetric) degree of substitutability between the downstream products: when $\gamma = 0$ the goods produced in the downstream sector are independent, while when γ tends to $\overline{\gamma}$ they tend to perfect substitutes.[8,9] Alternatively, buyers produce the same good but they sell it in distinct (symmetric) geographical areas. In this case γ measures the degree of integration between the areas: when $\gamma = 0$ trade costs are so high that each area represents an independent market (the autarky case) while when γ tends to $\overline{\gamma}$ trade costs are negligible and the areas tend to be perfectly integrated.

As usual, we solve the game backwards. In what follows, we characterise the equilibria in the final market, the price and the entry decision. Finally, we characterise the solution of the whole game according to the toughness of downstream competition, *given the number of buyers.*

[5] Moreover, as in Segal and Whinston (2000), the incumbent's offer to a buyer is not contingent on the other buyers' behaviour.

[6] We follow Segal and Whinston (2000) in assuming that price offers to buyers are restricted to be linear.

[7] However, we assume that it is such that existence and uniqueness of pure strategy Nash equilibria (at the downstream market stage of the game) are guaranteed.

[8] We want to exclude the case of *perfectly* homogeneous goods in order for Segal and Whinston's assumption that $x^*(\gamma) > 0$ for any γ to hold (see below assumption [*SW1*]).

[9] A possible alternative interpretation is that, for any given degree of product substitution, when $\gamma = 0$ firms maximise joint profits while when $\gamma = \overline{\gamma}$ there exists price competition, with intermediate degrees of competition for $0 < \gamma < \overline{\gamma}$.

2.1.2 Downstream competition

Let us denote by $q^*(w_i, w_j, \gamma)$ and $\Pi_B^*(w_i, w_j, \gamma)$ the *equilibrium* quantity sold by the i-th buyer in the final market and his respective profit (gross of the incumbent's compensation, if any), expressed as *continuous* functions of the own input cost (w_i), of the rival's input cost (w_j) and of the toughness of competition in the final market. We assume that:

[A1]: $\Pi_B^*(w_i, w_j, \gamma)$ *is weakly decreasing in the price she pays for the input* w_i *and weakly increasing in the rival's input cost* w_j*. Further, when* $w_i = w_j = w$, $\Pi_B^*(w, w, \gamma)$ *is strictly decreasing in* w.

[A2]: $q^*(w_i, w_j, \gamma)$ *is weakly decreasing in the own input cost, weakly increasing in the rival's input cost and, when* $w_i \leq w_j$, *weakly increasing in the toughness of competition in the downstream market.*

The interpretation of these assumptions is intuitive. The cheaper the own input the more a buyer sells in the downstream market, the higher her profit. The opposite holds, the cheaper the rival's input. When both buyers obtain the input at the same price, the cheaper the input the higher their individual profit. In other words, the change of the own input cost has a stronger impact than the change of the rival's.[10] Finally, when a buyer pays less for the input than her rival, her output increases with the toughness of downstream competition (because the tougher downstream competition the stronger the competitive advantage provided by obtaining a cheaper input and/or because competition increases market demand through a price reduction).[11]

2.1.3 Price decisions

At time t_2 active upstream firms set input prices, given the decisions taken in the previous stages. There are four relevant cases to study:

(i) both buyers signed the exclusive contract $(S = 2)$ and entry did not occur.

(ii) a buyer only signed the exclusive contract $(S = 1)$ and entry did not occur.

(iii) both buyers rejected the exclusive contract $(S = 0)$ and entry occurred.

(iv) a buyer only signed the exclusive contract $(S = 1)$ and entry occurred.

In case (i) the incumbent sets w_I^s in order to maximise its profit $\pi_{I|S=2}$:

$$\max_{w_I^s} 2\left[\left(w_I^s - c_I\right) q^*\left(w_I^s, w_I^s, \gamma\right) - x\right] \tag{1}$$

Of course, the optimal price $w_{I|S=2}^{s*}(\gamma)$ is higher than c_I. Let $\Pi_{I|S=2}^*(\gamma)$ be the incumbent's maximum profit gross of the compensation.

If one buyer only signs the exclusive contract and entry did not occur (case ii), the free buyer must turn back to the incumbent which, in principle, can charge her a different price than the one charged

[10] Note that we ask for weak monotonicity to cover also the very special case where wholesale prices are so different that the high cost buyer does not sell anything at equilibrium.

[11] We do not need to make any assumption on how $q^*(w_i, w_j, \gamma)$ changes when $w_i > w_j$.

to the buyer who signed. However, in this setting the incumbent has no incentive to price discriminate between buyers (it will charge the monopoly price to both of them) and the optimal input prices are the same as in case (i): $w^{s*}_{I|S=1} = w^{f*}_{I|S=1} = w^{s*}_{I|S=2}$. The only difference is that the incumbent does not pay any compensation to the buyer who did not sign.

If entry occurred (case iii and iv), the entrant and the incumbent compete for the free buyer(s). Given *[A1]* and that the entrant is more efficient than the incumbent, at the equilibrium it will always win the competition for the free buyer(s) by choosing a price not higher than c_I.[12] Hence, if both buyers have rejected the exclusive contract and entry occurred (case iii), the entrant chooses w_E in order to solve the following programme:

$$\max_{w_E} \left[2\left(w_E - c_E\right) q^*\left(w_E, w_E, \gamma\right) - F\right] \qquad (2)$$
$$s.t.\ w_E \leq c_I$$

Let $w^*_{E|S=0}(\gamma)$ be the optimal price.[13] Of course both buyers pay less for the input if they obtain it from the more efficient entrant than if they sign the exclusive contract and the market is monopolised by the incumbent ($w^*_{E|S=0}(\gamma) < w^{s*}_{I|S=2}(\gamma)$). As in the model by Segal and Whinston (1996, 2000), by *[A1]* each buyer is better off in the former case (in the absence of any compensation).[14] Let $x^*(\gamma)$ denote each buyer's gain from efficient entry:

[SW1]: $x^*(\gamma) \equiv \Pi^*_{B|S=0}\left(w^*_{E|S=0}, w^*_{E|S=0}, \gamma\right) - \Pi^*_{B|S=2}\left(w^{s*}_{I|S=2}, w^{s*}_{I|S=2}, \gamma\right) > 0$ for any γ.

Note that, when buyers are final consumers (as assumed by Segal and Whinston, 1996, 2000), the monopoly deadweight loss implies that the maximum amount that the incumbent is willing to offer to *each* buyer is lower than her gain from efficient entry. We maintain this assumption, that in our setting is written as:

[SW2]: $\frac{\Pi^*_{I|S=2}(\gamma)}{2} \leq x^*(\gamma)$ for any γ, where $x^*(\gamma)$ is defined by *[SW1]*.

Finally, if one buyer only signs the exclusive contract and entry occurred (case iv), the incumbent chooses the price w^s_I for the "exclusive buyer" and, simultaneously, competes with the entrant for the free buyer. Let $w^*_{E|S=1}(\gamma)$ and $w^{s*}_{I|S=1}(\gamma)$ the pair of input prices that solves the entrant and the incumbent's problems, respectively:[15]

[12] The competition for the free buyer(s) leads to multiple input price equilibria. We select the only one that is not in weakly dominated strategies.

[13] If the entrant is much more efficient than the incumbent, the constraint is not binding and $w^*_{E|S=0} < c_I$. For simplicity, we shall disregard this case in the examples treated in the appendix.

[14] In the setting of Segal and Whinston buyers are final consumers so that each buyer's gain from efficient entry simply comes from an increase of consumer surplus.

[15] Note that in Segal and Whinston (1996, 2000) the incumbent always charges the monopoly price to the buyer who signed the exclusive contract (irrespective of the behaviour of the other buyer). The reason is that buyers are final consumers so that the revenues from selling to each of them is completely independent of the price paid by any other buyer. In the present setting instead, unless products are completely independent ($\gamma = 0$), the equilibrium quantity sold by a buyer in the downstream market (and hence, his input demand) is affected by the input price paid by the other buyer. This is taken into account by both the incumbent and the entrant when choosing their input price. In particular, setting $w_{I|S=1} = w^{s*}_{I|S=2}$ is not necessarily the optimum since by decreasing the input price, the incumbent can improve the competitive position of its buyer. Hence, $w^{s*}_{I|S=1}(\gamma) \leq w^{s*}_{I|S=2}(\gamma)$.

$$\max_{w_E} \left[(w_E - c_E)\, q^* \left(w_E, w_I^s, \gamma \right) - F \right]$$
$$s.t.\ w_E \leq c_I$$
$$\max_{w_I^s} \left[(w_I^s - c_I)\, q^* \left(w_I^s, w_E, \gamma \right) - x \right].$$

Let $\Pi^*_{E|S=1}(\gamma)$ and $\Pi^*_{I|S=1}(\gamma)$ represent the upstream producers' equilibrium profit gross of the fixed costs and of the compensation.

We assume that

[A3]: The entrant's equilibrium profit $\Pi^*_{E|S=1}(\gamma)$ is strictly increasing in γ.

The rationale behind this assumption is that, since the entrant sets an input price $w_E \leq c_I$, the "free buyer" obtains the input at a lower price than the "exclusive buyer" ($w^*_{E|S=1}(\gamma) \leq w^{s*}_{I|S=1}(\gamma)$). Thus, by *[A2],* as downstream competition intensifies, *ceteris paribus* the "free buyer" sells more and more in the downstream market. This positively affects the entrant's profit via the input demand. The examples in the Appendix satisfy *[A3]* and illustrate two possible ways this effect can operate.

Finally, as stated by Lemma 1, when entry occurred, for a buyer it is more profitable to be the only one to obtain the input from the more efficient entrant with respect to the case when also the rival buyer does:

Lemma 1 *:* $\Pi^*_{B|S=1}\left(w^*_{E|S=1}, w^{s*}_{I|S=1}, \gamma\right) - \Pi^*_{B|S=0}\left(w^*_{E|S=0}, w^*_{E|S=0}, \gamma\right) \geq 0$ *for any* γ.

Proof. First, $w^*_{E|S=1}(\gamma) \leq w^*_{E|S=0}(\gamma)$ as, when the entrant serves one buyer only, it does not take into account the negative externality that it imposes on the other upstream producer by reducing the input price. Second, $w^{s*}_{I|S=1}(\gamma) \geq c_I \geq w^*_{E|S=0}(\gamma)$. By [A1], $\Pi^*_{B|S=1}\left(w^*_{E|S=1}, w^{s*}_{I|S=1}, \gamma\right) - \Pi^*_{B|S=0}\left(w^*_{E|S=0}, w^*_{E|S=0}, \gamma\right) \geq 0$. ■

Let us define the gain from entry for a buyer who is the only one to have rejected the exclusive deal as:

$$\widetilde{x}(\gamma) \equiv \Pi^*_{B|S=1}\left(w^*_{E|S=1}, w^{s*}_{I|S=1}, \gamma\right) - \Pi^*_{B|S=2}\left(w^{s*}_{I|S=2}, w^{s*}_{I|S=2}, \gamma\right) \tag{3}$$

It is easy to check that Lemma 1 implies that

$$\widetilde{x}(\gamma) \geq x^*(\gamma) > 0 \text{ for any } \gamma \tag{4}$$

where $x^*(\gamma)$ is defined by *[SW1]*: the gain from entry for a buyer who has rejected the exclusive deal is larger if she is the only one having rejected than if the rival rejected as well. By *[SW2]*, it follows that the maximum amount that the incumbent is willing to offer to *each* buyer is also lower than $\widetilde{x}(\gamma)$:

$$\frac{\Pi^*_{I|S=2}(\gamma)}{2} < \widetilde{x}(\gamma) \text{ for any } \gamma. \tag{5}$$

2.1.4 Entry decision

Given the number of buyers who accepted the exclusionary contract S, entry occurs if and only if the entrant recovers the fixed costs:

$$\Pi^*_{E|S}(\gamma) - F > 0 \tag{6}$$

where $\Pi^*_{E|S}(\gamma)$ represents the entrant's maximum profit gross of the fixed costs when S buyers accepted the exclusive deal.

We follow Segal and Whinston (1996, 2000) in assuming that the market is viable for the entrant if all buyers reject the exclusive contract. This requires that fixed costs are sufficiently low:[16]

[SW3]: $F < \overline{F} \equiv \min_\gamma \left\{ \Pi^*_{E|S=0}(\gamma) \right\}.$

Recall that the case studied by Segal and Whinston where buyers are final consumers is equivalent, in this setting, to the case where downstream markets are independent $(\gamma = 0)$. Their assumption that the demand of a single buyer does not suffice to trigger entry is translated in the following one:

[SW4] $F \geq \underline{F} \equiv \Pi^*_{E|S=1}(0).$

When downstream markets are independent, being more efficient than the rival buyer does not allow to steal any of the latter's business and/or prices in the final market are high enough so that the input demand of a single buyer is never sufficiently large to make entry profitable.

However, by *[A3],* the tougher downstream competition the higher the entrant's profit from selling to a single buyer. This allows to identify a threshold level of the fixed costs $F' \equiv \sup_\gamma \Pi^*_{E|S=1}(\gamma)$ with $F' \in \left(\underline{F}, \overline{F}\right)$ such that the following cases can be distinguished (see also Figure 2):[17]

case 1 : *if* $F \in \left[F', \overline{F}\right)$, $\Pi^*_{E|S=1}(\gamma) \leq F$ *for any* γ.

case 2 : *if* $F \in [\underline{F}, F')$, *by continuity of* $\Pi^*_{E|S=1}(\gamma)$ *and [A3] there exists a threshold value of the toughness of competition in the downstream market* $\gamma^*(F)$ *such that* $\Pi^*_{E|S=1}(\gamma) > F$ *if and only if* $\gamma > \gamma^*(F)$.

In other words, if entry costs are high enough, the demand of a single buyer never suffices to trigger entry. Taking into account downstream competition does not provide additional insights with respect to the model by Segal and Whinston. By contrast, if fixed costs are not prohibitive and competition in the downstream market sufficiently tough, the incumbent needs to lock both buyers in order to deter entry. As the following Section illustrates, in this case the implication of the analysis can be dramatically different with respect to those obtained when buyers are final consumers.

[16] We do not impose any restriction on $\Pi^*_{E|S=0}(\gamma)$ even if it is reasonable to expect that it is increasing in γ as in Figure 2.

[17] We are implicitly assuming that $\sup_\gamma \Pi^*_{E|S=1}(\gamma) < \min_\gamma \left\{ \Pi^*_{E|S=0}(\gamma) \right\}$. If this assumption does not hold, $F' \geq \overline{F}$ and *case 2* only arises.

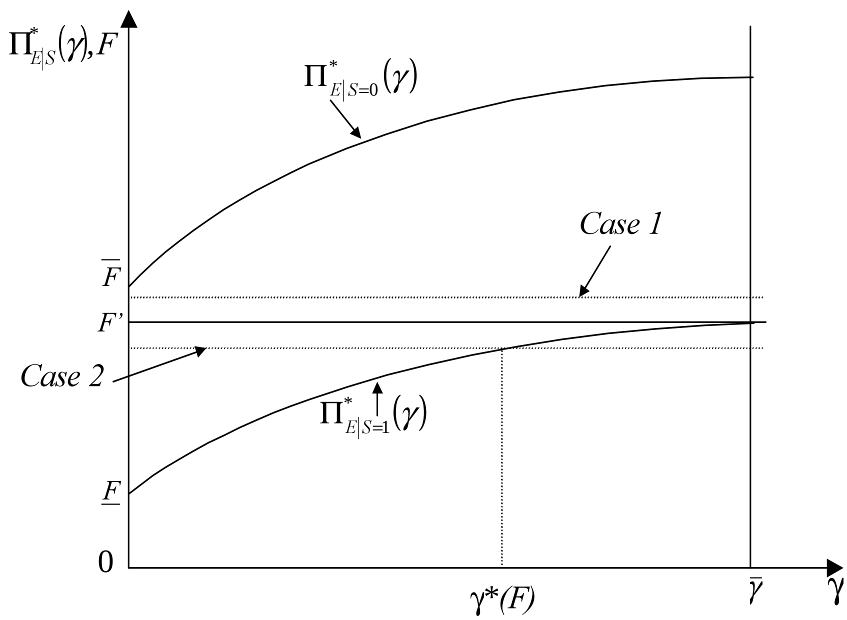

Figure 2: *Entry decision.*

2.1.5 Solution of the model

We now characterise the solution of the whole game. We discuss the equilibria arising when the following condition is satisfied:

$$\Pi^*_{I|S=1}(\gamma) < x^{**}(\gamma) \equiv \Pi^*_B\left(w^*_{E|S=0}, w^*_{E|S=0}, \gamma\right) - \Pi^*_B\left(w^{s*}_{I|S=1}, w^*_{E|S=1}, \gamma\right) \tag{7}$$

for any $\gamma > \gamma^*(F)$. Condition (7) simply says that, when the individual demand makes entry profitable and one buyer rejected the exclusive contract, the incumbent cannot profitably compensate the remaining buyer for the loss she would suffer accepting the exclusive deal. This allows to simplify the analysis by ruling out asymmetric entry equilibria (i.e. entry equilibria where one buyer signs the exclusive contract) without affecting the results of the analysis.

Proposition 1 shows that tough downstream competition, by making individual demand enough to trigger entry, prevents the incumbent from exploiting the buyers' coordination failure to exclude.

Proposition 1 *When the incumbent makes simultaneous offers to buyers and is unable to discriminate, the equilibria of the whole game have the following properties:*

1. *if either fixed costs are sufficiently high* $\left(F \in \left[F', \overline{F}\right)\right)$ *or they are not* $(F \in [\underline{F}, F'))$ *but downstream competition is soft enough* $(\gamma \leq \gamma^*(F))$, *both* ***"exclusion equilibria"*** *and* ***"entry equilibria"*** *exist. They can take the following forms:*

   (i) EXCLUSION EQUILIBRIA: $x \in \left[0, \frac{\Pi^*_{I|S=2}(\gamma)}{2}\right]$ *and* $S = 2$.

(ii) ENTRY EQUILIBRIA: $x \in [0, x^*(\gamma)]$ *and* $S = 0$.

2. *if fixed costs are sufficiently low* ($F \in [\underline{F}, F')$) *and downstream competition is sufficiently intense* ($\gamma > \gamma^*(F)$), *only **"entry equilibria"** exist. They take the following form:*

   $x \in [0, x^{**}(\gamma)]$ *and* $S = 0$.

Proof. 1. The logic of this case is the same as Segal and Whinston's where exclusion equilibria arise because the incumbent takes advantage of the buyers' coordination failure. Since the demand of a single buyer does not attract entry, no buyer has incentive to deviate from $S = 2$. Equilibria where the incumbent offers a strictly positive compensation are sustained by having the continuation equilibria following any offer $\widehat{x} \neq x$ with $\widehat{x} \in [0, x^*]$ be such that $S = 0$. However, equilibria where $S = 0$ also exist. By the assumption of non-discriminatory offers and *[SW2]*, the incumbent cannot profitably prevent these equilibria from arising.

2. In this case, "exclusion equilibria" cannot exist. Suppose $x \in \left[0, \frac{\pi^*_{I|S=2}(\gamma)}{2}\right]$ and $S = 2$. The deviation of a single buyer attracts entry. By *(5)* the incumbent cannot profitably prevent it by offering a sufficiently high compensation. The equilibria are given by $x \in [0, x^{**}(\gamma)]$ followed by $S = 0$. First, the incumbent has no incentive to deviate and offer a compensation followed by $S = 2$. It should offer at least $\widetilde{x}$ to both buyers, which is not profitable by *(5)*. Second, by *(7)*, the incumbent has no incentive to deviate and offer at least x^{**} to both buyers so that $S = 1$ follows. ■

2.2 Simultaneous and discriminatory offers

Offering discriminatory compensations[18] gives the incumbent an additional instrument to exploit the externality that a buyer exerts on the other by accepting the exclusive contract.

Let us consider first the case where the demand of a single buyer is not enough to trigger entry. The incumbent can induce both buyers to sign the exclusive contract by offering a compensation x^* to *one* of them.[19] Once this buyer is locked in to the incumbent, the remaining buyer cannot do better than accepting the exclusive contract, even for free. This is the reason why discriminatory offers facilitate exclusion. Hence, even if by *[SW2]* it is not profitable to offer x^* to both buyers, it may be profitable to offer it to a single buyer. If so, "entry equilibria" do not arise. If both buyers rejected the exclusive contract, the incumbent could profitably deviate offering x^* to one of them.

Tough downstream competition changes the picture when it makes individual demand large enough to trigger entry. In this case, the incumbent should secure both buyers to exclude, since a single deviant buyer would trigger entry. The possibility to discriminate its offers does not facilitate entry deterrence as both buyers should be sufficiently compensated. As already discussed for the case of uniform offers, this is too costly.

[18] As in Segal and Whinston (1996, 2000) we focus on the case of observable offers.

[19] Note that when offers are constrained to be non-discriminatory, the incumbent cannot offer a compensation to one buyer only.

Proposition 2 *When the incumbent makes simultaneous offers to buyers and is able to discriminate, the equilibria of the whole game have the following properties:*

1. *if either fixed costs are sufficiently high* $\left(F \in \left[F', \overline{F}\right)\right)$ *or they are not* $(F \in [\underline{F}, F'))$ *but downstream competition is soft enough* $(\gamma \leq \gamma^* (F))$*, two cases may arise:*

   CASE A: $\Pi^*_{I|S=2} (\gamma) > x^* (\gamma)$

   only ***"exclusion equilibria"*** *exist. They take the following forms:*

   (i) $x_1 + x_2 \leq x^* (\gamma)$ *and* $S = 2$;

   (ii) $x_i = x^* (\gamma)$, $x_j = 0$ *with* $i \neq j = 1, 2$ *and* $S = 1$.

   CASE B: $\Pi^*_{I|S=2} (\gamma) \leq x^* (\gamma)$[20]

   both ***"exclusion equilibria"*** *and* ***"entry equilibria"*** *exist. They can take the following forms:*

   (i) EXCLUSION EQUILIBRIA: $x_1 + x_2 \leq \Pi^*_{I|S=2} (\gamma)$ *and* $S = 2$.

   (ii) ENTRY EQUILIBRIA: $x_i \in [0, x^* (\gamma)]$ *for* $i = 1, 2$ *and* $S = 0$.

2. *if fixed costs are sufficiently low* $(F \in [\underline{F}, F'))$ *and downstream competition is sufficiently intense* $(\gamma > \gamma^* (F))$*, only* ***"entry equilibria"*** *exist. They take the following form:*

   $x_i \in [0, x^{**}]$ *for* $i = 1, 2$ *and* $S = 0$.

Proof. 1. In this case the demand of a single buyer is never enough to trigger entry. If $\Pi^*_{I|S=2} (\gamma) > x^* (\gamma)$ (CASE A), an equilibrium where $S = 0$ does not exist. The incumbent could profitably deviate and offer $x^* (\gamma)$ to *one* buyer, which would be followed by $S = 2$. By exploiting the buyers' coordination failure the incumbent can indeed exclude at no cost: $x_1 = x_2 = 0$ followed by $S = 2$ is an equilibrium. Equilibria where the incumbent offers strictly positive compensations are sustained by the appropriate continuation equilibria. If instead, $\Pi^*_{I|S=2} (\gamma) \leq x^* (\gamma)$ (CASE B), it is not profitable to offer $x^* (\gamma)$ to a single buyer and the incumbent cannot prevent "entry equilibria" from arising. Coordination failures explain why "exclusion equilibria" might still arise.

2. In this case, individual demand is large enough with respect to fixed costs to make entry profitable. Hence, if $S = 0$, the incumbent should offer at least $\widetilde{x}$ to *each* buyer so that $S = 2$ follows. By condition *(5)* this is not profitable. Hence, the incumbent cannot prevent "entry equilibria" from arising. Further, as shown by Proposition 1, the incumbent cannot exploit the buyers' coordination failure to exclude. Hence, "exclusion equilibria" do not arise. By *(7)*, the "entry equilibria" are given by $x_i \in [0, x^{**} (\gamma)]$ followed by $S = 0$. ■

[20] We assume that, when indifferent, the incumbent does not deviate from the "entry equilibria". Without this assumption, all the listed ones are equilibria when $\Pi^*_{I|S=2} (\gamma) = x^* (\gamma)$.

2.3 Sequential offers

When offers are sequential the incumbent has the most effective instrument to put one buyer against the other so that in principle it is easier to exclude.

Consider the case where individual demand does not make entry profitable, and the incumbent's profit from monopolising the market suffices to compensate a buyer from the loss he suffers when efficient entry does not occur (CASE A). Let us solve the game backwards. The second buyer always accepts the exclusive contract. If the first buyer signed, entry will not occur and the buyer cannot but accept, even if she is not offered any compensation. If the first buyer did not sign, the incumbent can profitably bribe the second buyer to make her sign by offering x^*. The first buyer, anticipating that the following one will always sign, cannot but sign, even if she is not offered any compensation. Thus, the incumbent ends up monopolising the market for free, without having to rely on coordination failures.

Instead, if the incumbent cannot profitably bribe the pivotal buyer (CASE B) exclusion equilibria do not arise. The intuition is very simple. If the first buyer rejected the exclusive contract, the incumbent cannot induce the second buyer to sign by sufficiently bribing her, so that also the second buyer rejects. The first buyer, anticipating that if she rejects the second does the same (and that if she signs, so does the second buyer), rejects the exclusive contract. The incumbent cannot profitably induce her to sign. In a sense, in this case sequentiality is counterproductive for the incumbent because it allows the buyers to coordinate.

Let us consider the role of downstream competition. As already discussed, tough enough competition may allow entry even if one buyer only rejects the exclusive contract. Further, rejecting when the rival buyer has signed is very profitable, for instance because obtaining a cheaper input than the rival's provides a very strong competitive advantage. This implies that if a buyer signs the exclusive contract, the other one requires a very high compensation to sign $(\widetilde{x})$. This highlights the difference with the case where the demand of a single buyer does not trigger entry: in that case, if a buyer accepts the exclusive contract, the other is willing to accept for free. Since tough downstream competition makes it very costly to bribe a buyer, the incumbent cannot profitably exclude, as the following Proposition establishes.

Proposition 3 *When the incumbent makes sequential offers to buyers, the equilibria of the whole game have the following properties:*

1. *if either fixed costs are sufficiently high* $\left(F \in \left[F', \overline{F}\right)\right)$ *or they are not* $(F \in [\underline{F}, F'))$ *but downstream competition is soft enough* $(\gamma \leq \gamma^*(F))$*, two cases may arise:*

   CASE A: $\Pi^*_{I|S=2}(\gamma) \geq x^*(\gamma)$.

   Only ***"exclusion equilibria"*** *exist. They take the following form:*

   $x_1 = x_2 = 0$ *and* $S = 2$.

   CASE B: $\Pi^*_{I|S=2}(\gamma) < x^*(\gamma)$.

Only ***"entry equilibria"*** *exist. They take the following form:*

$x_i \in [0, x^*(\gamma)]$ *for* $i = 1, 2$ *and* $S = 0$.

2. *if fixed costs are sufficiently low* ($F \in [\underline{F}, F')$) *and downstream competition is sufficiently intense* ($\gamma > \gamma^*(F)$), *only* ***"entry equilibria"*** *exist. They take the following form:*

   (i) If $\Pi^*_{I|S=2}(\gamma) - \widetilde{x}(\gamma) < \Pi^*_{I|S=1}(\gamma)$, $x_1 \in [0, x^{**}(\gamma)]$, $x_2 \in [0, x^{**}(\gamma)]$, $S = 0$.

   (ii) If $\Pi^*_{I|S=2}(\gamma) - \widetilde{x}(\gamma) \geq \Pi^*_{I|S=1}(\gamma)$, $x_1 \in [0, x^*(\gamma)]$, $x_2 \in [0, x^{**}(\gamma)]$, $S = 0$.

Proof. 1. In this case individual demand does not make entry profitable. Let us solve the game backwards. CASE A: If the first buyer rejects, the second one requires $x^*(\gamma)$ to accept. Since $\Pi^*_{I|S=2}(\gamma) \geq x^*(\gamma)$ the incumbent can profitably offer it. If the first buyer accepts, entry will not occur and the second buyer accepts even if $x_2 = 0$. The first buyer, anticipating that the second always accepts, will accept even if $x_1 = 0$. CASE B: If the first buyer rejects, the second one requires $x^*(\gamma)$ to accept. Since $\Pi^*_{I|S=2}(\gamma) < x^*(\gamma)$ the incumbent cannot profitably offer it. If the first buyer accepts, entry will not occur and the second buyer accepts even if $x_2 = 0$. Anticipating this, the first buyer requires $x^*(\gamma)$ to accept but the incumbent cannot profitably offer it.

2. Case *(i)*. Given that individual demand makes entry profitable, if the first buyer rejects, the second one requires $x^{**}(\gamma)$ to accept. By *(7)* the incumbent cannot profitably offer $x^{**}(\gamma)$ to the second buyer who, thus, does not accept. If the first buyer accepts, the second buyer requires $\widetilde{x}(\gamma)$ to sign as well. By $\Pi^*_{I|S=2} - \widetilde{x} < \Pi^*_{I|S=1}$, the incumbent is not willing to offer it. Thus the second buyer does not accept. The first buyer anticipates that the second buyer never accepts and requires $x^{**}(\gamma)$ to accept. The incumbent cannot profitably offer it.

Case *(ii)*. If the first buyer rejects, the analysis is the same as in case (i). If the first buyer accepts, now the incumbent is willing to offer $\widetilde{x}(\gamma)$ to the second, who accepts. Anticipating this, the first buyer requires $x^*(\gamma)$ to accept. However, conditions *[SW2]* and *(5)* imply that $\Pi^*_{I|S=2} < \widetilde{x} + x^*$, so that the incumbent cannot profitably offer $x^*(\gamma)$ to the first buyer and $\widetilde{x}(\gamma)$ to the second. ■

3 Appendix

In this Section we provide two parametric examples: in the first one (Section 3.1) the toughness of downstream competition is captured by the degree of substitutability between the final products, in the second one it is captured by the degree of integration between the downstream markets (Section 3.2). Even if the mechanisms at work are different, in both cases all the assumptions adopted in the general formulation of the model are satisfied.

3.1 Example 1: Product substitutability

In this Section we solve the model assuming that final consumers' preferences are represented by the following utility function first proposed by Shubik and Levitan (1980):

$$U = v\sum_{i=1}^{n} q_i - \frac{n}{2(1+\gamma)}\left[\sum_{i=1}^{n} q_i^2 + \frac{\gamma}{n}\left(\sum_{i=1}^{n} q_i\right)^2\right] + y \tag{8}$$

where y is an outside good, q_i is the quantity of the i-th product, v is a positive parameter, n is the number of products in the industry, and $\gamma \in [0, \infty)$ represents the degree of substitutability between the n products.[21] Since the utility function is quasi-linear, the consumers' decisions on the outside good y do not affect their decisions taken with respect to the differentiated goods, so that we can develop the analysis in a partial equilibrium framework.

From the maximisation of the utility function subject to the income constraint, we can derive the inverse demand function as

$$p_i = v - \frac{1}{1+\gamma}\left(nq_i + \gamma\sum_{j=1}^{n} q_j\right) \tag{9}$$

We focus on the case where $n = 2$ and we solve the model assuming that firms compete in quantities but the same results could be proved in the case of price competition.[22] Without loss of generality we normalise the entrant's variable cost to zero $(c_E = 0)$. Moreover, we assume that the efficiency gap between the incumbent and the entrant is not extremely large $\left(c_I \leq \frac{5v}{13}\right)$. This assumption implies that the entrant's constraint is always binding, thus making the exposition of the results neater and shorter, without any other implication. We have solved the model for higher values of c_I and nothing changes.

In the last stage of the game, simple algebra shows that:

$$\Pi_B^*(w_i, w_j, \gamma) = \max\left\{\frac{(4v + v\gamma + \gamma w_j - 2\gamma w_i - 4w_i)^2 (1+\gamma)(2+\gamma)}{(4+3\gamma)^2 (4+\gamma)^2}, 0\right\} \tag{10}$$

$$q^*(w_i, w_j, \gamma) = \max\left\{\frac{(1+\gamma)[(4+\gamma)v + \gamma(w_j - 2w_i) - 4w_i]}{(4+\gamma)(4+3\gamma)}, 0\right\}. \tag{11}$$

It is easy to check that $q^*(w_i, w_j, \gamma)$ and $\Pi_B^*(w_i, w_j, \gamma)$ are continuous and that *[A1]* and *[A2]* are satisfied. We can, thus, compute the market share of buyer i, given by:

$$\alpha_i(w_i, w_j, \gamma) = \frac{4v + \gamma(v + w_j) - 2w_i(2+\gamma)}{(4+\gamma)(2v - w_j - w_i)}. \tag{12}$$

It can be checked that if a buyer pays for the input less than her rival $(w_i < w_j)$, her market share increases with γ. This highlights the "business stealing effect": obtaining a cheaper input provides a stronger competitive advantage the tougher competition in the downstream market.

Let us study the price decisions of the incumbent and of the entrant.

When $S = 2$, $w_{I|S=2}^{s*} = \frac{v+c_I}{2} > c_I$, and

[21] A peculiarity of this demand function is that aggregate demand does not vary with the degree of substitutability. This makes the role of the intensity of competition in the downstream market in facilitating entry deterrence come out more clearly. Note also that in this example $\overline{\gamma} = \infty$.

[22] The advantage of considering quantity competition is that $x^* > 0$ for any γ. In the case of price competition, $x^* > 0$ requires that extremely high values of γ are excluded.

$$\pi^*_{I|S=2} = \frac{(v-c_I)^2(1+\gamma)}{2(4+3\gamma)} - 2x; \quad \pi^*_{B|S=2} = \frac{(2+\gamma)(v-c_I)^2(1+\gamma)}{4(4+3\gamma)^2} + x. \tag{13}$$

When $S = 0$, $w^*_{E|S=0} = c_I$, and

$$\pi^*_{E|S=0} = \frac{2(v-c_I)(1+\gamma)c_I}{4+3\gamma} - F; \qquad \Pi^*_{B|S=0} = \frac{(2+\gamma)(v-c_I)^2(1+\gamma)}{(4+3\gamma)^2}. \tag{14}$$

By using these payoffs it follows that $x^*(\gamma) > 0$ for any γ (condition *[SW1]*) and that $\frac{\Pi^*_{I|S=2}(\gamma)}{2} \leq x^*(\gamma)$ (condition *[SW2]*) for any γ.

Finally, when $S = 1$ and entry occurred,

$$w^*_{E|S=1} = c_I; \quad w^{s*}_{I|S=1} = \tfrac{(4+\gamma)v+(3\gamma+4)c_I}{4(2+\gamma)} > c_I. \tag{15}$$

One can check that $w^{s*}_{I|S=1}(\gamma)$ is decreasing in γ and that the optimal input prices are such that $w^*_{E|S=1}(\gamma) = w^*_{E|S=0}(\gamma) < w^{s*}_{I|S=1}(\gamma)$. This confirms that $\Pi^{f*}_{B|S=1} - \Pi^*_{B|S=0} \geq 0$ for any γ, as stated by Lemma 1. Hence, conditions (4) and (5) follow $\left(\widetilde{x}(\gamma) \geq x^*(\gamma) > 0 \text{ and } \frac{\Pi^*_{I|S=2}(\gamma)}{2} < \widetilde{x}(\gamma), \text{ for any } \gamma\right)$.

The optimal input prices allow to compute the agents' payoffs as follows, where f denotes the payoff of the ("free") buyer who addressed the entrant and s the buyer who signed the exclusive deal:

$$\begin{array}{ll} \pi^*_{I|S=1} = \frac{(1+\gamma)(v-c_I)^2(4+\gamma)}{8(4+3\gamma)(2+\gamma)} - x & \pi^*_{E|S=1} = \frac{(8+5\gamma)(v-c_I)(1+\gamma)c_I}{4(4+3\gamma)(2+\gamma)} - F \\ \Pi^{f*}_{B|S=1} = \frac{(8+5\gamma)^2(v-c_I)^2(1+\gamma)}{16(4+3\gamma)^2(2+\gamma)} & \pi^{s*}_{B|S=1} = \frac{(v-c_I)^2(1+\gamma)(2+\gamma)}{4(4+3\gamma)^2} + x. \end{array} \tag{16}$$

First, one can check that $\Pi^*_{E|S=1}$ is strictly increasing in γ (*[A3]* is satisfied). The intuition is the following. *Ceteris paribus,* as downstream competition intensifies, prices in the final market decrease and aggregate demand increases. On top of this, the "business stealing effect" allows the "free buyer" (who obtains the input at a lower price than the "exclusive buyer", $w^*_{E|S=1}(\gamma) < w^{s*}_{I|S=1}(\gamma)$), to increases her market share. Hence, as downstream competition intensifies, *ceteris paribus* the "free buyer" sells more and more in the downstream market. This increases the entrant's profit via the input demand. However, tougher downstream competition makes the incumbent decrease the price charged to the "exclusive buyer" ($w^{s*}_{I|S=1}(\gamma)$ is decreasing in γ). This negatively affects the quantity sold by the "free buyer" in the downstream market and the entrant's profit. In this model, the former effect is stronger so that $\Pi^*_{E|S=1}$ is strictly increasing in γ.

Second, it can be checked that $\widetilde{x}(\gamma)$ is strictly increasing in γ. With respect to the case where both buyers sign the exclusive deal and entry does not occur, rejecting the exclusive deal when the rival buyer signs and entry occurs provides two advantages. First, the "free buyer" pays less for the input; second, she pays less than her rival. The tougher downstream competition, the stronger the competitive advantage provided by using a cheaper input, the more profitable to reject when the rival buyer signs. Hence, the higher the gain from efficient entry for the only buyer who rejects and the more costly for the incumbent to block individual deviations.

Finally, it can be checked that $\Pi^*_{I|S=1}(\gamma) < x^{**}(\gamma)$ for any γ, so that condition (7) is satisfied.

It is now possible to identify the interval of feasible entry costs $\left[\underline{F}, \overline{F}\right)$ as indicated in Figure 2. Since $\Pi^*_{E|S=0}(\gamma)$ is increasing in γ,

$$\overline{F} = \Pi^*_{E|S=0}(0) = \tfrac{(v-c_I)c_I}{2} \qquad \underline{F} = \Pi^*_{E|S=1}(0) = \tfrac{(v-c_I)c_I}{4}.$$

Finally, note that $\lim_{\gamma\to\infty} \Pi^*_{E|S=1}(\gamma) < \Pi^*_{E|S=0}(0)$. Hence, the threshold F' (see Figure 2) always exists and can be defined as follows:

$$F' = \lim_{\gamma\to\infty} \Pi^*_{E|S=1}(\gamma) = \tfrac{5c_I(v-c_I)}{12}.$$

The threshold $\gamma^*(F)$ is identified by solving $\Pi^*_{E|S=1}(\gamma) = F$ for $F \in [\underline{F}, F')$, as Figure 2 illustrates.

Finally, it can be checked that only case A arises in Propositions 2 and 3 and that $\widetilde{x}(\gamma) > \Pi^*_{I|S=2}(\gamma) - \Pi^*_{I|S=1}(\gamma)$ so that only case *(i)* arises in Proposition 3.

3.2 Example 2: Market integration

We consider two countries, 1 and 2, each with a population size $\frac{s}{2}$ of consumers having demand function $q = 1 - p$ for a homogenous good. This means that aggregate demand in each country k is given by $Q_k = \frac{s}{2}(1 - p_k)$. By inverting the demand functions we obtain (inverse) demand in country k as:

$$p_k = 1 - \frac{2Q_k}{s}, \; k = 1, 2. \tag{17}$$

In this model each buyer-downstream firm is located in a country (buyer-firm 1 in country 1 whereas buyer-firm 2 in country 2). These two firms do not incur trade costs when buying the input either from the entrant or from the incumbent. We normalise the entrant's variable cost to zero ($c_E = 0$) and we assume that $c_I < 1$ in order for the market to be viable for the incumbent.

We also assume that the only cost for downstream firms is the wholesale price they pay for the input, and that they compete à la Cournot in the two markets. Hence, each firm $i = 1, 2$ sets the output q_{ik} it wants to sell in country k. There is a transportation cost t to be paid to sell the output in the export market, modelled as an additional variable cost that a firm incurs. In this model, trade costs represent an inverse measure of competition (one can think of t as the inverse of γ, to keep in line with the previous notation). The lower t the deeper the integration between the two markets and the tougher competition between the domestic and the foreign firm. As $t \to 0$ the two national markets tend to be a unique one. For simplicity, we impose an upper bound on trade costs $\left(t \leq \bar{t} \equiv \min\left\{\frac{2}{7}(1 - c_I), 2 - \frac{26c_I}{5}\right\}\right)$. This assumption ensures that exports are always feasible. Moreover it allows to focus on the case where the entrant's constraint is always binding. As already remarked in the previous example, this makes it easier to present the results without any other implication.

In the last stage of the game, the profit functions can be written as:

$$\pi_i = (p_i - w_i)\, q_{ii} + (p_j - w_i - t) q_{ij} \tag{18}$$

with $i \neq j = 1, 2$. Taking the first-order conditions and solving the system one finds the equilibrium outputs as:

$$q_{ii}^* = \max\left\{\frac{s}{6}(1 + t - 2w_i + w_j), 0\right\} \; q_{ij}^* = \max\left\{\frac{s}{6}(1 - 2t - 2w_i + w_j), 0\right\}. \tag{19}$$

with $i \neq j = 1, 2$. Thus, when exports are feasible, the total quantity sold by buyer i in the two markets and her profits are given by

$$q^*(w_i, w_j, t) = \frac{s}{3}\left(1 + w_j - 2w_i - \frac{t}{2}\right) \tag{20}$$

$$\Pi_B^*(w_i, w_j, t) = \frac{s}{18}\left[(1 - 2w_i + w_j + t)^2 + (1 - 2w_i + w_j - 2t)^2\right]. \tag{21}$$

where $i \neq j = 1, 2$. It is easy to check that $q^*(w_i, w_j, t)$ and $\Pi_B^*(w_i, w_j, t)$ are continuous and that *[A1]* and *[A2]* are satisfied. In particular, the deeper market integration (the lower t) the more competitive a firm in the foreign market but the tougher her rival in the domestic market. Hence, the higher exports and the lower the quantity sold in the domestic market. The former effect prevails.

Let us study the price decisions of the incumbent and of the entrant.

When $S = 2$, $w_{I|S=2}^{s*} = \frac{2-t+2c_I}{4} > c_I$, and

$$\pi_{I|S=2}^* = \frac{s(2 - t - 2c_I)^2}{24} - 2x; \qquad \pi_{B|S=2}^* = \frac{s\left(37t^2 + 4 + 4c_I^2 - 4t + 4tc_I - 8c_I\right)}{144} + x. \tag{22}$$

When $S = 0$, $w_{E|S=0}^* = c_I$, and

$$\pi_{E|S=0}^* = \frac{sc_I(2 - 2c_I - t)}{3} - F; \quad \Pi_{B|S=0}^* = \frac{s\left[5t^2 - 2t(1 - c_I) + 2(1 - c_I)^2\right]}{18}. \tag{23}$$

By using these payoffs it follows that $x^*(t) > 0$ for any feasible t (condition *[SW1]*) and that $\frac{\Pi_{I|S=2}^*(t)}{2} \leq x^*(t)$ (condition *[SW2]*) for any feasible t.

Finally, when $S = 1$ and entry occurred,

$$w_{E|S=1}^* = c_I \qquad w_{I|S=1}^{s*} = \tfrac{1}{4} + \tfrac{3}{4}c_I - \tfrac{t}{8} > c_I. \tag{24}$$

Note that $w_{I|S=1}^{s*}(t)$ is decreasing in t. The deeper market integration (i.e., the stronger competition), the higher the buyer's saving in trade costs. This allows the incumbent to profitably increase the wholesale price.

Further, the optimal input prices are such that $w_{E|S=1}^*(t) = w_{E|S=0}^*(t) < w_{I|S=1}^{s*}(t)$. This confirms that $\Pi_{B|S=1}^{f*} - \Pi_{B|S=0}^* \geq 0$ for any feasible t, as stated by Lemma 1. Hence, conditions (4) and (5) follow $\left(\widetilde{x}(t) \geq x^*(t) > 0 \text{ and } \frac{\Pi_{I|S=2}^*(t)}{2} < \widetilde{x}(t), \text{ for any feasible } t\right)$.

The optimal input prices allow to compute the agents' payoffs as follows, where f denotes the payoff of the buyer who addressed the entrant and s the buyer who signed the exclusive deal.

$$\begin{array}{llll} \pi^*_{I|S=1} = \frac{s(2-2c_I-t)^2}{96} - x; & & \pi^*_{E|S=1} = \frac{sc_I(10-10c_I-5t)}{24} - F \\ \Pi^{f*}_{B|S=1} = \frac{s\left(100-200c_I-100t+100c_I^2+100c_It+169t^2\right)}{576}; & & \pi^{s*}_{B|S=1} = \frac{s\left(4-8c_I-4t+4c_I^2+4c_It+37t^2\right)}{144} + x. \end{array} \tag{25}$$

One can check that $\Pi^*_{E|S=1}$ is strictly decreasing in t (*[A3]* is satisfied). In this example, the mechanism behind this property is slightly different than in the previous one. As market integration increases, *ceteris paribus* the "free buyer" sells more and more in the downstream market, thus increasing the entrant's profit. This is mainly due to the fact that market integration intensifies competition in the market and decreases final prices. On top of this, deeper market integration allows the incumbent to profitably increase the price charged to the "exclusive buyer" ($w^{s*}_{I|S=1}$ is decreasing in t). This positively affects the quantity sold by the "free buyer" in the downstream market and the entrant's profit.

Finally, it can be checked that $\Pi^*_{I|S=1}(t) < x^{**}(t)$ for any feasible t, so that condition (7) is satisfied.

We identify also in this case the interval of feasible entry costs $\left[\underline{F}, \overline{F}\right)$ and the threshold value F' (see Figure 2). Since $\Pi^*_{E|S=0}(t)$ is decreasing in t,

$$\overline{F} = \Pi^*_{E|S=0}\left(\overline{t}\right) = \begin{cases} \frac{16s}{15}c_I^2 & \text{if } c_I > \frac{15}{43} \\ \frac{4s}{7}c_I(1-c_I) & \text{otherwise.} \end{cases}$$
$$\underline{F} = \Pi^*_{E|S=1}\left(\overline{t}\right) = \begin{cases} \frac{2s}{3}c_I^2 & \text{if } c_I > \frac{15}{43} \\ \frac{5s}{14}c_I(1-c_I) & \text{otherwise.} \end{cases}$$

Finally, note that $\lim_{t\to 0}\Pi^*_{E|S=1}(t) < \Pi^*_{E|S=0}\left(\overline{t}\right)$. Hence, F' always exists and can be defined as follows:

$$F' = \lim_{t\to 0}\Pi^*_{E|S=1}(t) = \frac{s}{24}c_I(10-10c_I).$$

Since $\Pi^*_{I|S=2}(t)/2 = x^*(t)$, only case A arises in Propositions 2 and 3.

Finally, it can be checked that $\widetilde{x}(t) > \Pi^*_{I|S=2}(t) - \Pi^*_{I|S=1}(t)$: therefore, only case *(i)* arises in Proposition 3.

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