

Exclusive dealing: the interaction between foreclosure and investment promotion

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29 October, 2007

VERY PRELIMINARY AND INCOMPLETE

Abstract

This paper studies a model where exclusive dealing (ED) can both promote investment and foreclose a more efficient supplier. While investment promotion is usually regarded as a pro-competitive effect of ED, our paper shows that it may be the reason why a contract that forecloses a more efficient supplier is signed. Absent the effect on investment, the contract would not be signed and foreclosure would not be a concern. For this reason, considering potential foreclosure and investment promotion in isolation and then summing them up may not be a suitable approach to assess the net effect of ED. The paper shows that taking into account their interaction may lead to very different conclusions.

1 Introduction

Exclusive contracts require a buyer to purchase only from one seller, and their possible effects on competition has been at the centre of attention of economists and lawyers for a long time. In particular, antitrust courts began to investigate the possible foreclosure effects of such contracts a long time ago, and the case law contains several examples of companies which have been found to have infringed antitrust laws due their use of exclusive clauses.¹

The industrial organization literature has struggled to explain why anticompetitive exclusive contracts may arise, but by now there are a number of papers which have shown that exclusive dealing may deter efficient entry and which analyze the conditions under which this can occur. This literature on what we would call "anticompetitive effect of exclusive dealing" is composed among others by the contributions of Aghion and Bolton (1985), Rasmusen, Ramseyer and Wiley (1991), Segal and Whinston (2000a), and Fumagalli and Motta (2006).

On the other hand, there is also consensus on the fact that exclusive contracts may in certain circumstances stimulate investments, for instance by solving free-riding problems (for instance, if a seller cannot appropriate the investment it makes in the training and assistance of a common retailer) or by avoiding opportunistic behavior in relationships which may be characterized by hold-up problems. These "procompetitive effects of exclusive dealing" have for instance been analyzed by Besanko and Perry (1993), Spier and Whinston (1995), Segal and Whinston (2000b), and De Meza and Selvaggi (forthcoming).

Currently, under US case-law the procompetitive rationale of exclusive contracts seems to prevail: it is very infrequent that firms endowed with monopoly power are found to have infringed the Sherman Act due to the use of exclusive clauses. On the contrary, in Europe it is the exclusionary effects of exclusive deals which are emphasised: in the EU exclusive contracts by dominant firms are ruled out by a *de facto* per se prohibition rule, and efficiency effects are usually not even considered in competition cases.

These very different treatments of exclusive dealing may soon come to an end, as both in the US and in the EU the policy towards monopolization or abusive practices is being reconsidered,² and many observers argue in favour of an approach where exclusive contracts must be assessed by weighing the anti- and the pro-competitive effects of exclusive contracts against each other.

However, the fact that the two literatures on anti- and pro-competitive effects have developed into two separate directions does not facilitate the task of assessing the net competitive effects of exclusive dealing. The objective of this

¹Among early important decisions involving exclusive dealing arrangements, see *Standard Fashion Co. v. Magrane-Houston Co.* [258 U.S. 346 (1922)], *Standard Oil Co. of California v. U.S.* [337 US 293 (1949)], and *U.S. v. United Shoe Machinery Corporation* [347 U.S. 521 (1954)]. Among recent cases, see *Schöller v. Commission*, European Court Case T-9/95, *U.S. v. Microsoft* (1995 Consent Decree), *U.S. v. Dentsply* [399 F.3d 181 (2001)], *Conwood v. United States Tobacco* [290 F.3d 768 (2002)] and *U.S. v. Visa USA* [344 F.3d 229 (2003)].

²U.S. Courts take the anti-competitive effects of exclusive dealing more seriously in several recent cases (such as the ones mentioned in footnote 1 above). In the EU the formalistic approach concerning the implementation of art. 82 is now under revision.

paper is to contribute to fill this gap by offering a simple but unifying framework where exclusivity may give rise to both foreclosure effects and promotion of investments.

In our base model, an incumbent supplier can offer a buyer an exclusive contract which cannot be breached. If signed, this contract *commits* the buyer to purchase only from the incumbent. After exclusivity is signed or rejected, investment decisions are taken. An investment - which can be made by either the incumbent or the buyer - increases the value of the transaction between the incumbent and the buyer, and may have an external effect, i.e., it may increase or decrease the value of the transaction between the buyer and the entrant supplier. Then, an efficient entrant - which observes all the previous decisions - decides whether to enter or not in the industry. If it does - which at equilibrium can happen only if exclusivity has not been signed - the incumbent and the entrant compete in prices.

Within this model, both (a) welfare-detrimental foreclosure and (b) welfare-enhancing protection of investments can in principle take place. (a) Foreclosure may take place because if the exclusive dealing promotes investments then the joint surplus of the buyer and the incumbent may be larger under exclusive dealing than without. As a result, exclusivity may be signed at equilibrium while preventing efficient entry (the entrant's surplus is not internalized when the parties sign the exclusive contract). (b) Exclusive dealing may also promote investments, as for instance in the case where it is the incumbent who invests and absent exclusive dealing the incumbent would not be able to appropriate the investment because there are positive spillovers, i.e. the investment increases the value of the trade between the buyer and the entrant.

Our simple setting allows us to fully characterize the equilibria of the game, and to show under which circumstances exclusive dealing occurs at equilibrium, and if so, when it decreases or it increases welfare.

One of our main results is that considering *jointly* the exclusionary and pro-competitive effects of exclusive dealing gives rise to fundamentally different results than when one considers these effects separately and then 'sum them up'. Indeed, we show that it is possible that (i) absent investments the exclusive dealing would not raise any policy problem because it would not be signed at equilibrium; that (ii) when considering only pro-competitive effects the exclusive dealing will indeed favour welfare-enhancing investments; but (iii) when one introduces the possibility of investments into an exclusionary model (without breach) the exclusive dealing occurs and it is detrimental at equilibrium. In other words, it is possible that the sum of the effects identified by considering separately (i) the standard exclusionary model without investments and (ii) the model where exclusion of an efficient entrant cannot arise, yields a different result than in (iii) a model where exclusion and investments are both possible.

We also analyze the case where the exclusive contract can be renegotiated (we model breach of contract through the payment of expectation damages to the incumbent).³ In this case, not surprisingly, entry of a more efficient supplier

³We are agnostic about the degree of realism of the renegotiation assumptions. We feel

will never be deterred, as it is always better for all the parties to renegotiate exclusivity so as to achieve higher total surplus.⁴

More surprising, though, exclusive dealing may occur at equilibrium and be welfare detrimental even when it can be breached. This is because exclusivity may promote inefficient investments and may be used to extract rents from the entrant.

The paper closest to ours is probably Segal and Whinston (2000b). Segal and Whinston develop a very general framework to study the investment protection determinants of exclusive dealing, and its welfare effects.

Our analysis differs from theirs under several respects. First, we also consider the possibility that breach is not allowed, so as to allow for possible foreclosure of efficient entry; second, as opposed to Segal and Whinston who adopt a cooperative approach, we follow a fully non-cooperative approach, and model breach through the payment of expectation damages; third, we study a simple parametric model, which is by definition less general, but which captures the essential elements at work while allowing for a full characterization of the equilibrium outcomes (while S&W's general framework obliges them to assume restrictions on parameter values whenever there are effects of opposite signs, so as to establish the sign of the effects).

Overall, we regard our analysis as complementary to theirs.

The paper proceeds as follows. Section 2 presents a simple example where investment choices take a binary form and which aims at illustrating why considering jointly anti- and procompetitive effects gives rise to new insights. Section 3 presents the model. Sections 3.2 and 3.3 study the case where it is the incumbent which invests (the former assumes that breaching of exclusivity is not possible; the latter allows for breaching). Section 3.4 studies the case where it is the buyer which invests in the incumbent-buyer relationship. Section 4 concludes the paper.

2 A simple example

Before introducing the model formally, let us propose a simple example which captures some features of the game we analyse more rigorously below and which

that in many circumstances renegotiating contracts would be extremely costly, whereas in others it would not be. In the former case, which could be described by our "no-breach" base model, exclusive contracts would include a high degree of commitment. In the latter case, renegotiation would be the most appropriate assumption, and we model this case through our "breach" version of the model.

⁴In Aghion and Bolton (1986), an exclusive buyer can still buy from the entrant if it pays a penalty which is agreed contractually at the same time as the exclusive clause (so there is breach but not renegotiation). In that paper, anticompetitive effects still arise because there is a stochastic model. When the incumbent sets the penalty, it does not know the precise efficiency level of the entrant. If it did, it would always fix the penalty in such a way as to allow it to enter and capture its rents through the penalty; but not knowing it, it can make mistakes and fix the penalty at a level where entry is deterred. In Spier and Whinston (1995) the anticompetitive effects may arise when both renegotiation of contracts and investments are possible.

illustrates why combining exclusionary and procompetitive aspects of exclusive dealing might give rise to some new insights.

Consider first a situation where - like in the literature on exclusive dealing which can deter entry - investments are not possible (or are infinitely costly) and exclusive dealing cannot be breached (or breach would carry infinite penalties).

Suppose that the joint value of the transaction between the buyer, B , and the incumbent supplier, I , is given by v_I . If the buyer could instead trade with an alternative supplier (or entrant), E , the value of the transaction would be v_E . Suppose also that the entrant is able to appropriate only a proportion $1 - b$ of the efficiency rents $v_E - v_I$ that it creates, the remaining proportion $b > 0$ being appropriated by the buyer, or by the coalition between the buyer and the incumbent (the model we specify below is consistent with this division of the surplus, but we do not need to enter into details at this point).

It is easy to see in this case (no breach, no investments) that I and B would not sign an exclusive contract: the coalition between the two of them would get a joint surplus v_I if they signed the exclusive contract, whereas it could reach a surplus $v_I + b(v_E - v_I)$ if there was no exclusivity in place. (In Figure 1, which illustrates this example, this payoff corresponds to the area $N + A + B$.) This is nothing else than an alternative way to obtain the Chicago School result that an exclusive contract that deters efficient entry would not occur at equilibrium. In this setting, there is no reason to worry about exclusive dealing.

Consider now a situation - in line with the literature on procompetitive exclusive dealing as in Segal and Whinston (2000b) - where deterrence of an efficient entrant is not an issue because an exclusive contract can be breached, and exclusive dealing may serve the purpose of stimulating investments.

Suppose that the incumbent can undertake an investment $x < v_E - v_I$, for simplicity at an arbitrarily low cost ϵ . This investment raises by an amount x the value of the internal trade between the buyer and the incumbent, and by an amount λx the external trade between the buyer and the entrant. (We focus here on $\lambda \in (0, 1)$, but also consider negative spillovers in the rest of the paper.) As long as the incumbent's payoff is larger under exclusive dealing than absent it, the incumbent will invest more if protected by an exclusivity clause: by using a normalisation, suppose that absent exclusive dealing the investment would not be undertaken, whereas under exclusivity it would. For instance, if, as in the model we specify below, absent exclusive dealing the inefficient incumbent makes zero profits, whereas under exclusivity, which removes competition with the more efficient entrant, it gets strictly positive profits which are increasing in x , then the incumbent will make the investment only in the latter case.

If exclusive dealing was not renegotiated, the value of the trade between the incumbent and the buyer, and therefore their joint surplus, becomes $v_I + x$; instead, if it was breached, the value of the trade between the entrant and the buyer would be $v_E + \lambda x > v_I + x$. The incumbent and the buyer have an incentive to renegotiate the exclusivity clause, and under the assumption above, they would be able to extract a share b of the entrant's efficiency rent. Their expected joint payoff under (renegotiable) exclusive dealing would therefore be $v_I + x + b(v_E + \lambda x - v_I - x)$. (In Figure 1, this payoff corresponds to the area

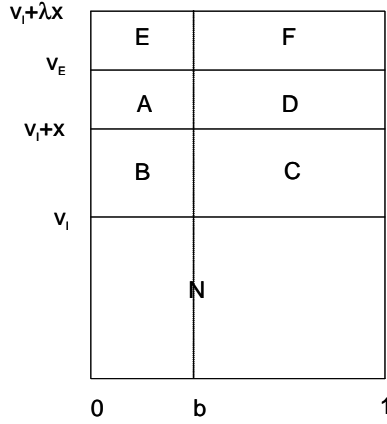


Figure 1: Effect of Exclusive Dealing: an example.

$N + E + A + B + C$) Since this is larger than the joint payoff they could obtain absent exclusivity, it follows that the exclusive contract will be signed and it will be welfare-improving. Indeed, total surplus under (renegotiable) exclusive dealing will equal $v_E + \lambda x$, which is larger than the total surplus v_E which arises under no exclusivity. (In Figure 1, the welfare gain provided by the additional investments amounts to the area $E + F$.)

Therefore, by analysing separately the exclusionary aspects of exclusive dealing (in a no-breaching, no-investment model) and its procompetitive effects (in a breaching and investment model), we might conclude that exclusive dealing does not raise competitive issues: absent investments, it cannot exclude entry, whereas if we consider its possible effects of protecting investments, exclusive dealing would even be procompetitive.

Surprisingly, though, it turns out that introducing the possibility for the incumbent supplier to invest into the simple no-breach model might actually lead to an exclusive dealing clause to be signed and to be welfare-detrimental.

Suppose as before that the incumbent can undertake an investment $x < v_E - v_I$ at a cost ϵ , and that it will do it only under exclusive dealing. This implies that under (non-renegotiable) exclusive dealing the joint surplus of the incumbent and the buyer becomes $v_I + x$ (area $N + B + C$ in Figure 1). Therefore, their joint surplus will be larger under exclusive dealing than absent it if $v_I + x > v_I + b(v_E - v_I)$, or $x > b(v_E - v_I)$. If this condition (which in Figure 1 amounts to $C > A$) holds, exclusive dealing will be signed and it will be welfare-detrimental, as total surplus without exclusivity would have been higher: $v_E > v_I + x$. (In Figure 1, the exclusive contract will deprive society of the area D , which will be lost when the efficient entrant is excluded from the market.)

Intuitively, what happens here is that the coalition between the buyer and the incumbent uses the investment to increase its rents above the level it could

attain if there was no exclusive dealing, but by doing so it excludes the entrant, which is still more efficient even ex-post, that is after the investment is made.

This simple example shows that the introduction of investments into a standard exclusionary model might - rather than have a procompetitive effect - result in anticompetitive exclusive dealing being signed at equilibrium. Further, it shows that looking separately at the exclusionary effects (within a model where exclusive dealing cannot be renegotiated and investments cannot be made) and at the procompetitive effects (within a model where efficient entrants cannot be excluded and investments can be made) might be misleading. If we think that competition policy should deal with exclusive dealing by balancing its possible anticompetitive and procompetitive effects, we should look at a model where both effects might be considered.

Of course, this example was very stylized, and in particular it modelled investments in a very simplified way. We now turn to our formal model, which will allow us to study more rigorously the effects at play in a setting where exclusive clauses can both have procompetitive and entry-deterrence effects.

3 The model

Assume that there is an incumbent firm, I, an alternative supplier (or potential entrant), E, and a buyer, B. For simplicity, the buyer has an inelastic demand function, its utility from consuming good $i = I, E$ being

$$\begin{aligned} U_i &= \theta_i - p_i \text{ if } p_i \leq \theta_i, \\ U_i &= 0 \quad \text{if } p_i > \theta_i, \end{aligned} \tag{1}$$

where θ_i is its valuation for product i .

We assume that the two suppliers are equally efficient (their marginal costs of production are normalised to zero: $c_E = c_I = 0$), but that, absent investments, the buyer's initial valuations for their products are $v_I < v_E$. We consider one-dimensional investments: either the incumbent or the buyer can invest into their relationship, and the buyer's ex-post valuation for good I is given by $\theta_I = v_I + x$, with x being the investment made either by the incumbent or the buyer.⁵ The investment may have external effects, i.e., it may affect the value of the relationship between the buyer and the entrant: we denote with $\theta_E = v_E + \lambda x_j$ the ex-post valuation of the buyer for good E , with $\lambda \in [-1, 1]$ being the spillover parameter. When $\lambda = 0$, only the internal value of the relationship between B and I is affected; when $\lambda > 0$, an investment increases not only the internal value of the transaction, but also the external value, i.e., the value of the transaction between the buyer and the entrant (this is the case that Segal and Whinston (2000b) call "complementarity effect"). This might be

⁵For simplicity, we do not consider explicitly investment decisions by the entrant. However, our results will generally depend on v_E , which can be thought of as determined by the sum of the initial valuation plus the entrant's investments.

the case where, for instance, an investment is made into general training of the sales personnel of the retailer B , and the personnel can sell more effectively both suppliers' goods; when $\lambda < 0$, an investment which improves the value of the trade between B and I will reduce the value of external trade, that is the trade between B and E (Segal and Whinston (2000b) call this case "substitutability effect"). An example of such an effect may arise if for instance a new software is introduced which allows to market better product I but is incompatible with the previous software used, making it more difficult to sell product E .

We analyse the following game. At time 1, the incumbent offers an exclusive deal (ED, t) to the buyer, where t is the compensation that I makes to B in order for the latter to accept the exclusivity, i.e. to agree not to buy from supplier E . The buyer accepts or rejects the contract, and the outcome of the exclusivity offer is publicly observed. At time 2, investment decisions x are taken (we shall allow for either the incumbent or the buyer to invest). Investment decisions are costly, and we assume that $C(x) = \gamma x^2/2$. At time 3, if exclusivity clauses are in place they might be breached. We shall contrast two cases: under the *no breach* case, which is our base case, the penalty for breaching an exclusive contract is assumed to be infinitely costly, i.e. exclusive contracts have a full commitment value. Under the *breaching* case, instead, we assume that the exclusivity can be breached provided that the incumbent is paid expectation damages, i.e. it is paid the amount of profits it would have obtained if the contract had not been breached. Admittedly, this is not the only possible way to model breach, but it has the advantage of being relatively simple and of enjoying some support from both the theoretical literature and the courts.⁶ Indeed, it is often argued that courts would not be ready, for instance, to accept contractual damages which are punitive for the breaching party and much higher than the remuneration the other party would have received had the contract not been breached. Finally, at time 4 pricing decisions for the transactions are taken, and they are modelled in the following way. With a probability b it is the buyer who makes the price offer, and with probability $1 - b$ it is the supplier(s) who make them. For simplicity, we limit ourselves to consider the case where $b = 1/2$, but we shall discuss what happens under more general values of b whenever it may lead to different outcomes.⁷

⁶See Macaulay et al. (1995), Hatziz (2001) and Cooter and Ulen (2004) for legal studies documenting that courts in Civil Law countries tend to enforce expectation damages rather than privately stipulated damages. Aghion and Hermalin (1990), Stole (1992) and Hermalin and Katz (1993) provide some rationale for such legal restrictions on private contracts.

⁷Note that we do not model explicitly entry decision, and assume instead that firm E could always supply the market if profitable. Equivalently, we could make the entrant decide on entry after investment decisions are taken, and assume that fixed entry costs are zero. Assuming positive entry costs would not add further insights to the analysis, while making it (slightly) more complex. Formally, therefore, when exclusive dealing prevents the entrant from supplying the market (foreclosure), we cannot talk about 'entry deterrence' but this would be the case if entry costs were positive.

3.1 Solving the model - Last stage payoffs

As usual, we solve the model by backward induction, and start by the last stage of the game. We have to find the equilibrium payoffs for three cases: No exclusive dealing, exclusive dealing without the possibility to breach, and exclusive dealing under possible breaching.

Last stage Since competition is in prices and there are inelastic demands, the solutions of the price stage are straightforward. The profits earned by the three players under the different regimes, and for given investment levels x , are as follows. (Note that we use the convention of denoting with Π the gross profits, and with π the net profits, i.e. the gross profits minus the costs of the investment.)

No exclusive dealing (noED) Suppose no exclusivity clauses has been signed, so the buyer is free to buy from either supplier. The equilibrium solutions will depend on the level of the investment x . There are two cases:

- Case 1: $v_E + \lambda x \leq v_I + x$. In this case, x is large enough for the buyer's valuation to be higher for I 's product after the investment. If it is the buyer who makes the price offer (which occurs with probability $b = 1/2$), he will simply offer a zero price to the incumbent and buy from it, thereby extracting all the surplus $v_I + x$. If it is the suppliers who make the price offers, we shall have the standard asymmetric Bertrand game: the best offer firm E can make is $p_E = 0$. At this price, consumer surplus is $v_E + \lambda x$. Therefore firm I will win the buyer as long as it offers a price $p_I \leq (v_I + x) - (v_E + \lambda x)$. Profit maximisation implies that it will set the highest of such prices, leaving the buyer with surplus $v_E + \lambda x$. Expected surplus obtained by each buyer will therefore be:

$$\Pi_B = \frac{v_I + x}{2} + \frac{v_E + \lambda x}{2}; \quad \Pi_I = \frac{v_I + x - (v_E + \lambda x)}{2}; \quad \Pi_E = 0.$$

- Case 2: $v_E + \lambda x > v_I + x$. In this case, x is such that the ex-post buyer's valuation is still higher for E 's product. By using the same arguments as above, expected surplus obtained by each buyer will be:

$$\Pi_B = \frac{v_E + \lambda x}{2} + \frac{v_I + x}{2}; \quad \Pi_I = 0; \quad \Pi_E = \frac{v_E + \lambda x - (v_I + x)}{2}.$$

Exclusive dealing (ED) without possibility to breach If an exclusive contract has been signed and cannot be renegotiated, payoffs will be:

$$\Pi_B = \frac{v_I + x}{2}; \quad \Pi_I = \frac{v_I + x}{2}; \quad \Pi_E = 0.$$

Exclusive dealing with possible breaching (EDR) Consider now the case where an exclusive deal has been signed, but that it can be breached if the buyer pays expectation damages to the incumbent. Note also that, if breach does occur, we continue to model the bargaining power at the price stage as before: with a probability 1/2 it is the buyer who makes the price offer, and with the remaining probability 1/2 it is the suppliers which shall make it.

Note that here there are two cases. If x has been large enough, then no renegotiation will take place, as the buyer has a higher valuation for the incumbent's product. In this case, payoffs will be the same as in the case of no breach. Otherwise, renegotiation will take place. Payoffs are then as follows:

- Case 1: $v_E + \lambda x \leq v_I + x$.

$$\Pi_B = \frac{v_I + x}{2}; \quad \Pi_I = \frac{v_I + x}{2}; \quad \Pi_E = 0.$$

- Case 2: $v_E + \lambda x > v_I + x$.

$$\Pi_B = \frac{v_E + \lambda x}{2}; \quad \Pi_I = \frac{v_I + x}{2}; \quad \Pi_E = \frac{v_E + \lambda x}{2} - \frac{v_I + x}{2}.$$

Given the choice on exclusivity and given the investment level, the agents payoffs at time 3 are summarized by the following Table:

	No ED	ED (no breach)	ED (breach)
Π_I	$\begin{cases} \frac{v_I + x - v_E - \lambda x}{2} & \text{if } v_I + x > v_E + \lambda x \\ 0 & \text{otherwise} \end{cases}$	$\frac{v_I + x}{2}$	$\frac{v_I + x}{2}$
Π_B	$\frac{v_I + x}{2} + \frac{v_E + \lambda x}{2}$	$\frac{v_I + x}{2}$	$\begin{cases} \frac{v_I + x}{2} & \text{if } v_I + x > v_E + \lambda x \\ \frac{v_E + \lambda x}{2} & \text{otherwise} \end{cases}$
Π_E	$\begin{cases} 0 & \text{if } v_I + x > v_E + \lambda x \\ \frac{v_E + \lambda x - v_I - x}{2} & \text{otherwise} \end{cases}$	0	$\begin{cases} 0 & \text{if } v_I + x > v_E + \lambda x \\ \frac{v_E + \lambda x - v_I - x}{2} & \text{otherwise} \end{cases}$

Table 1: Agents' payoffs with and without exclusivity

Effect of ED on agents' payoff Table 1 highlights that ED increases the payoff of the incumbent, and reduces the payoffs of the buyer and the entrant.

Let us discuss first the case where the incumbent is ex-post more efficient ($v_I + x > v_E + \lambda x$). In this case, the possibility of breaching is immaterial, because the buyer and the incumbent have no incentive to renegotiate exclusivity (if any). The presence of ED eliminates competition between the incumbent and firm E and forces the buyer to trade only with the incumbent. This causes a loss to the buyer which coincides with the incumbent's gain: $-\Delta\Pi_B = (v_E + \lambda x)/2 = \Delta\Pi_I$. In other words, for given x , the presence of exclusivity redistributes welfare in favour of the incumbent leaving total welfare unchanged.

Instead, when the entrant is ex-post more efficient ($v_E + \lambda x > v_I + x$), whether breaching is possible makes a difference. Without breaching, the presence of ED causes a loss to the buyer which is *larger* than the incumbent's gain: $-\Delta\Pi_B = (v_E + \lambda x)/2 > (v_I + x)/2 = \Delta\Pi_I$. The reason is that the more efficient producer is foreclosed. Hence, ED does not only redistribute total surplus but it also reduces it. This effect does not arise when breaching is possible (as well as in Segal and Whinston 2000b), because the ex-post efficient outcome always arises. In our setting, it turns out again that the presence of exclusivity entails a loss to the buyer which coincides with the incumbent's gain ($-\Delta\Pi_B = (v_I + x)/2 = \Delta\Pi_I$), leaving total welfare unchanged.⁸

We will now solve for the investment decision undertaken by the incumbent at time 2 and for the contracting decision. For the sake of the exposition, we will treat separately the case where breaching is not possible (Section 3.2) and the one where breaching is allowed for (Section 3.3).

3.2 The Incumbent Invest - No breaching

3.2.1 Investment decision

At time 2, the incumbent chooses the level of investment in order to maximize its payoff net of investment costs:

$$\max_x \left[\Pi_I(x) - \frac{\gamma}{2}x^2 \right]$$

where $\Pi_I(x)$ is given by Table 1. The following Lemma identifies the optimal incumbent's choice.

Lemma 1 *When the incumbent invests,*

(i) the optimal level of investment (with and without exclusivity respectively) is given by:

$$\begin{aligned} x^{*ED} &= \frac{1}{2\gamma} \\ x^{*NoED} &= \begin{cases} 0 & \text{if } \gamma > \frac{(1-\lambda)^2}{4(v_E - v_I)} \equiv \gamma^\circ \\ \frac{(1-\lambda)}{2\gamma} & \text{otherwise} \end{cases} \end{aligned}$$

*(ii) When the spillover is positive ($\lambda > 0$), ED always stimulates the investment ($x^{*ED} > x^{*NoED}$). When the spillover is negative ($\lambda < 0$), ED stimulates the investment if the investment cost is high enough ($\gamma > \gamma^\circ$); ED limits the investment ($x^{*ED} < x^{*NoED}$), otherwise.*

⁸Note that the fact that, for a given investment level, the entrant obtains the same payoff irrespective of exclusivity, is due to our specific bargaining protocol. Under the bargaining procedure assumed by Segal and Whinston (2000), the presence of ED also harms the entrant, and it causes an increase in the incumbent's payoff which coincides with the *joint* loss of the buyer and the entrant. However, this difference does not affect results in an important way.

Proof. To be written. ■

Note that, absent exclusivity, the incumbent chooses not to invest, if the investment cost is sufficiently large. Intuitively, unless the investment is high enough to make the incumbent ex-post more efficient, investing entails costs to the incumbent but no benefit (see Table 1). In turn, since the investment cost is large, investing up to the point that the incumbent becomes more efficient ex-post is not profitable either.

Lemma 1 (ii) also highlights that the investment choice is affected by the presence of the ED. To see the intuition, let us compute the marginal benefit of the investment with and without exclusivity:

$$\frac{\partial \Pi_I^{ED}}{\partial x} = \frac{1}{2} \quad (2)$$

$$\frac{\partial \Pi_I^{noED}}{\partial x} = \begin{cases} \frac{1-\lambda}{2} & \text{if } v_I + x > v_E + \lambda x \\ 0 & \text{otherwise} \end{cases} . \quad (3)$$

Let us start from the case where the spillover is positive ($\lambda > 0$) so that the incumbent's investment benefits also the value of trade between the buyer and the entrant. From (2) and (3), it is easy to see that when $\lambda > 0$, the marginal benefit of the investment is always larger under exclusivity.

In particular, under exclusivity the buyer must trade with the incumbent (recall that we are considering here the case where breach is not possible), which appropriates the full value of such a trade ($v_I + x$) when it makes the offer. Additional investment, through the internal effect, increases $v_I + x$ and the incumbent entirely enjoys this benefit. Instead, absent exclusivity, suppliers compete. When the investment is low, so that the entrant is ex-post more efficient, the incumbent does not sell and it does not obtain any benefit from increasing the investment further. When the investment is high, so that the incumbent is more efficient ex-post, the incumbent trades with the buyer and makes profits equal to the ex-post efficiency gap with respect to the entrant ($v_I + x - v_E - \lambda x$), when suppliers make the offer. Note that the *internal* effect of additional investment increases this ex-post efficiency gap, while the *external* effect, i.e. the fact that investment increases also the value of trade between the entrant and the buyer, decreases it. Since the internal effect is stronger than the external one (i.e. $\lambda < 1$), the overall effect of additional investment is positive for the incumbent. However, the existence of the external effect makes the marginal benefit of the investment lower as compared to the case where exclusivity is in place. Differently stated, under exclusivity the incumbent does not internalize the external effect of the investment - which is counterproductive for it - thereby having stronger incentives to invest.

Note that when the incumbent is more efficient ex-post, it is precisely the existence of the external effect that makes investment incentives differ depending on exclusivity. If the incumbent's investment did not affect the value of trade between the buyer and the entrant (i.e. $\lambda = 0$), ED would redistribute rents in favour of the incumbent and would make it earn a larger payoff, but it would *not affect the investment benefits at the margin*, thereby leaving the equilibrium

choice unchanged (of course, provided that the investment cost is low enough to make the incumbent invest also when exclusivity is absent, i.e. $\gamma \leq \gamma^\circ$). Using the terminology of Segal and Whinston (2000b), the "irrelevance result" holds. Instead, the "irrelevance result" does not hold and ED stimulates investment also when $\lambda = 0$, if the investment cost is large enough ($\gamma > \gamma^\circ$). To see why, recall that when the investment is low so that the incumbent is less efficient ex-post, the incumbent earns zero profits absent exclusivity and the marginal benefit of the investment is zero. Under exclusivity, instead, the incumbent appropriates the value of trade with the buyer (when it makes the offer) and the marginal benefit of the investment is $1/2$. Hence, when the cost of investing is large, *irrespective of the value of λ* , ED makes incentives to invest stronger.⁹

This latter argument also explains why, when the spillover is negative ($\lambda < 0$), the impact of ED on investment depends on the level of investment costs. If investment costs are large ($\gamma > \gamma^\circ$), ED stimulates investment. Instead, when investment costs are low, ED *limits* the investment. The reason is that, when investment is high so that the incumbent is ex-post more efficient and $\lambda < 0$, the marginal benefit of the investment is *lower* under exclusivity (see 2 and 3). Now the external effect *reduces* the value of trade between the buyer and the entrant and adds to the internal effect in benefiting the incumbent. Under exclusivity the external effect is not internalized, thereby making incentives to invest weaker.

3.2.2 Contracting decision

In order to continue the analysis it proves useful to distinguish between the case where the investment raises also the value of trade between the buyer and the entrant (positive spillover) and the case where it reduces it (negative spillover).

Positive spillover ($\lambda > 0$) Let us start by studying under which conditions the ED is signed in equilibrium. We will then analyze its impact on total welfare.

ED as equilibrium choice

When $\gamma < \gamma^\circ$, the buyer and the incumbent have an incentive to sign the ED. To see why, first recall that for an exclusive agreement to be signed it must be that the joint payoff of the buyer and the incumbent (π_{B+I}) is larger under ED than absent ED.¹⁰ By applying the same logic as in Segal and Whinston

⁹Note that the reason why the irrelevance result does not hold is not that the incumbent's payoff is positive under exclusivity, whereas it is null absent exclusivity. The reason is that the positive payoff obtained under exclusivity is sensitive to investment.

¹⁰An alternative way to express the same condition is to say that the incumbent's gains from ED must be larger than the buyer's loss from it (if any), so that the former component can compensate the latter.

(2000b), it is easy to show that this is indeed the case:

$$\begin{aligned} \Pi_B^{ED}(x^{*ED}) + \Pi_I^{ED}(x^{*ED}) - \frac{\gamma(x^{*ED})^2}{2} &> \Pi_B^{ED}(x^{*NoED}) + \Pi_I^{ED}(x^{*NoED}) - \frac{\gamma(x^{*NoED})^2}{2} = \\ &= \Pi_B^{NoED}(x^{*NoED}) + \Pi_I^{NoED}(x^{*NoED}) - \frac{\gamma(x^{*NoED})^2}{2} \end{aligned}$$

Recall that, under positive spillover, ED fosters investment ($x^{*ED} > x^{*NoED}$). The former inequality follows from the fact that, under exclusivity, higher investments benefit both the incumbent (revealed preference) and the buyer (it extracts more surplus when it makes the offer). The second equality follows from the fact that eliminating exclusivity (for given investment) causes a loss to the incumbent which coincides with the buyer's gain.

When the investment is more costly ($\gamma > \gamma^\circ$), the previous argument cannot be applied. It is still true that, under exclusivity, higher investment benefits both the incumbent and the buyer. However, for given investment, removing the exclusivity makes efficient entry take place, thereby benefiting the buyer more than it harms the incumbent and increasing the joint payoff of the two. We cannot conclude a priori that the ED is signed for sure. Differently stated, a trade-off arises. On the one hand, exclusive dealing, by stimulating investment, benefits the buyer-incumbent coalition. On the other hand ED, by deterring entry, harms the buyer-incumbent coalition. The ED is signed when the former effect prevails. In order to identify under which conditions this is the case we have to compare the buyer-incumbent payoffs with and without exclusivity. The inequality $\pi_{I+B}^{ED}(x^{*ED}) \geq \pi_{I+B}^{NoED}(x^{*NoED})$ can be rewritten as:

$$v_I + \frac{1}{2\gamma} - \frac{1}{8\gamma} > \frac{v_E + v_I}{2}. \quad (4)$$

Condition (4) is satisfied, and thus ED will arise at the equilibrium, iff

$$\gamma < \frac{3}{4(v_E - v_I)} \equiv \gamma^s.$$

Note that $\gamma^s > \gamma^\circ$ when $\lambda > 0$.

Welfare effect of exclusive dealing

First note that the assumption that the exclusive contract cannot be renegotiated implies that, under exclusivity, total welfare coincides with the joint payoff of the incumbent and the buyer (the entrant cannot trade and makes zero profits). Hence, under exclusivity, higher investment increases total welfare:

$$W^{ED}(x^{*ED}) = \pi_{I+B}^{ED}(x^{*ED}) > \pi_{I+B}^{ED}(x^{*NoED}) = W^{ED}(x^{*NoED})$$

When $\gamma < \gamma^\circ$, the level of investment x^{*NoED} is large enough to make the incumbent ex-post more efficient than the entrant. Hence, the entrant makes no sales and zero profits also when exclusivity is not in place. It follows that

total welfare coincides with the joint payoff of the incumbent and the buyer also when exclusivity is not in place, and that, given x^{*NoED} , removing exclusivity leaves total welfare unchanged:

$$W^{ED}(x^{*NoED}) = \pi_{I+B}^{ED}(x^{*NoED}) = \pi_{I+B}^{NoED}(x^{*NoED}) = W^{NoED}(x^{*NoED})$$

Hence, when the ED is signed, it is welfare beneficial.

Instead, when investment costs are higher (i.e. $\gamma \geq \gamma^\circ$), the level of investment x^{*NoED} is such that the entrant is ex-post more efficient than the incumbent. Hence, absent exclusivity, entry occurs and firm E makes positive profits. It follows that, given x^{*NoED} , removing exclusivity increases total welfare. Hence, it cannot be said a priori that ED is welfare beneficial when B and I agree to sign it. Also in this case a trade-off arises: ED, by stimulating investment, has a positive effect on welfare but, by deterring entry, it exerts a negative effect on welfare. The ED is welfare beneficial when the former effect dominates. In order to identify under which conditions this is the case, let us compare total welfare with and without exclusivity. The inequality $W^{ED}(x^{*ED}) \geq W^{NoED}(x^{*NoED})$ can be rewritten as:

$$W^{ED}(x^{*ED}) = \pi_{I+B}^{ED} = v_I + \frac{1}{2\gamma} - \frac{1}{8\gamma} > v_E = W^{NoED}(x^{*NoED}) \quad (5)$$

Condition (5) is satisfied iff

$$\gamma < \frac{3}{8(v_E - v_I)} \equiv \gamma^w.$$

Note that $\gamma^w < \gamma^s$: in order for total welfare to increase, the investment-fostering effect of ED must be strong enough to compensate not only the loss suffered by the coalition buyer-incumbent but also the one suffered by firm E due to entry deterrence. Note also that $\gamma^w > \gamma^\circ$ for $\lambda > 0$. Figure 2) summarizes these results.

Remark 1 *The fact that ED fosters investment does not necessarily make the anti-competitive effect less likely. Indeed, ED may be welfare detrimental precisely because it fosters investment.*

To see this, note first that the case where investments are not allowed is equivalent in our setting to the case where $\gamma \rightarrow \infty$. In this case, as Figure 2 shows, no ED would arise at equilibrium. The reason is that there is no positive effect that can outweigh the foreclosing effect, so that the joint payoff of the incumbent and the buyer is necessarily reduced by ED. Differently stated, the 'Chicago School critique' applies and the incumbent cannot profitably induce the buyer to accept exclusivity because its gain for having the contract signed is lower than the buyer's loss. Next, observe that when the investment is possible, one can find a region where the ED is signed at equilibrium and it is *anticompetitive* (i.e. when $\gamma \in (\gamma^w, \gamma^s]$). ED, by stimulating the investment, increases

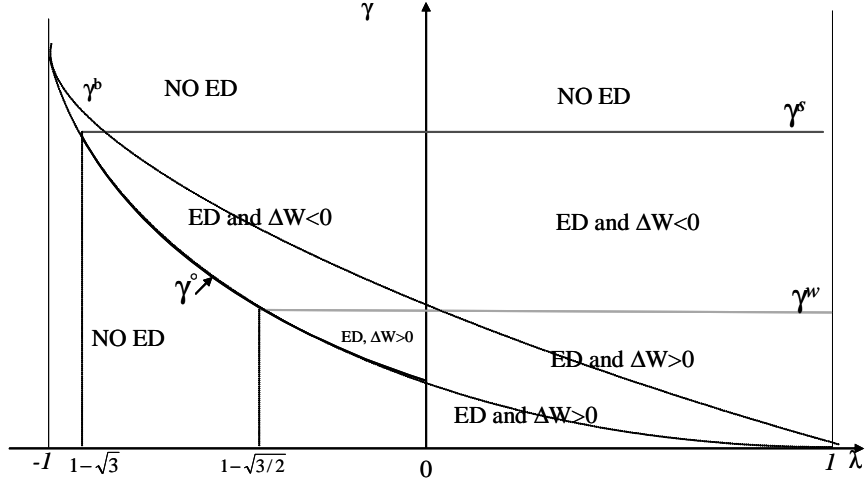


Figure 2: Equilibrium choices and welfare effects of ED when the incumbent invests and breaching is not possible.

the incumbent's gain from having the contract signed and decreases the buyers' loss, thereby making it possible for the incumbent to elicit acceptance in a profitable way. However, unless the investment cost is low enough, the benefit generated by larger investment is not sufficient to compensate for the harm that entry deterrence causes to society, and total welfare decreases.

Note that the thresholds γ^s and γ^w are increasing in $v_E - v_I$: the lower the ex-ante efficiency gap between the incumbent and the entrant, the more likely that ED is signed and it is welfare beneficial. The intuition is that the closer v_I to v_E , the lower the loss that entry deterrence causes both to the incumbent-buyer coalition and to society as a whole, so that it is more likely that the investment-fostering effect of ED prevails over the foreclosure effect.

Substitutable investment ($\lambda < 0$)

Let us move to the case where the investment reduces the value of trade between the buyer and the entrant.

ED as equilibrium choice

When $\gamma > \gamma^o$, ED fosters investment also when $\lambda < 0$, and the analysis is equivalent to the case of positive spillover. The only difference is that now the ED is signed in equilibrium both if the investment cost is low enough ($\gamma < \gamma^s$) and if the negative spillover is not too strong. Similarly, for the welfare effects (see also Figure 2 and Proposition 1).¹¹

¹¹The reason is that the threshold γ^o is decreasing in λ so that $\gamma^s > \gamma^o$ iff $\lambda > 1 - \sqrt{3}$ and

Instead, when $\gamma \leq \gamma^\circ$, ED *limits* the investment ($x^{*NoED} > x^{*ED}$). It follows that the parties do not have an incentive to inter into an exclusive contract:

$$\begin{aligned} \pi_B^{NoED}(x^{*NoED}) + \pi_I^{NoED}(x^{*NoED}) - \frac{\gamma(x^{*NoED})^2}{2} &> \pi_B^{NoED}(x^{*ED}) + \pi_I^{NoED}(x^{*ED}) - \frac{\gamma(x^{*ED})^2}{2} = \\ &= \pi_B^{ED}(x^{*ED}) + \pi_I^{ED}(x^{*ED}) - \frac{\gamma(x^{*ED})^2}{2} \end{aligned}$$

The former inequality follows from the fact that absent exclusivity higher investment benefits both the incumbent (revealed preference) and the buyer. Note that, absent exclusivity, a higher investment exerts two contrasting effects on the buyer's payoff. On the one hand, higher investment increases the value of trade with the incumbent, which is beneficial for the buyer; on the other hand, it reduces the value of trade with the entrant, which is detrimental for the buyer. However the external effect is weaker than the internal one ($\lambda > -1$) and the former effect dominates.

The latter equality follows from the fact that, when $\gamma \leq \gamma^\circ$, the level of investment x^{*ED} is such that the incumbent is ex-post more efficient than the entrant.¹² Then, given x^{*ED} , introducing exclusivity causes a loss to the buyer which coincides with the incumbent's gain, leaving the coalitional payoff unchanged.¹³

Remark 2 *The assumption $b = 1/2$ is not innocuous. If $b < 1/2$ and the negative spillover is sufficiently strong ($\lambda < -b/(1-b)$), higher investment harms the buyer. The reason is that, absent exclusivity, the buyer's payoff is formed by two components: when the buyer makes the offer (which occurs with probability b), it extracts the value of trading with the incumbent; when suppliers make the offer and compete (which occurs with probability $1-b$), the buyer extracts the value of trading with the entrant. Higher investment exerts a positive effect on the former and, due to the fact that the spillover is negative, a negative effect on the latter. When $b < 1/2$ the first component is relatively less important and, provided that the negative spillover is sufficiently strong, the detrimental effect of higher investment prevails.¹⁴ Then, it does not necessarily follow that the in-*

$\gamma^w > \gamma^\circ$ iff $\lambda > 1 - \sqrt{3/2}$. The reason is that γ° is the threshold level of investment costs such that the incumbent is indifferent between investing and not investing, absent exclusivity. The stronger the negative spillover, the larger the efficiency gap between the incumbent and the entrant, for given investment level. This, when exclusivity is not in place, (weakly) increases the incumbent's payoff from the investment, which is precisely given by such efficiency rents. Then, the stronger the negative spillover, the more likely that for the incumbent it is optimal to invest (absent exclusivity), the higher the threshold γ° .

¹²More precisely, $v_I + x^{*ED} > v_E + \lambda x^{*ED}$ iff $\gamma \leq \frac{1-\lambda}{2(v_E-v_I)} \equiv \gamma^b$ and $\gamma^b \geq \gamma^\circ$.

¹³If x^{*ED} was not large enough to make the incumbent ex-post more efficient, introducing ED by deterring entry would decrease the joint payoff of the incumbent and the buyer. Hence, *a fortiori* ED would not be signed in equilibrium.

¹⁴Note that for also for a generic b , $\gamma^b = \frac{(1-b)(1-\lambda)}{v_E-v_I} \geq \frac{(1-b)(1-\lambda)^2}{2(v_E-v_I)} = \gamma^\circ$. Hence, in the case we are analyzing ($\gamma \leq \gamma^\circ$), the buyer's payoff is given by $\pi_B = b(v_I + x) + (1-b)(v_E + \lambda x)$ not only when $x = x^{*NoED}$ but also when $x = x^{*ED}$.

cumbent and the buyer are jointly better off if they do not sign the ED. Indeed, if $\lambda < -2b/(1-b)$ the harm suffered by the buyer when investment increases dominates the incumbent's gain, and their joint payoff is higher when the ED is signed and investment is stifled. Note that, differently from the case where the spillover is positive, the parties have an incentive to enter into an ED because it limits (rather than stimulates) the investment. Note also that the ED is welfare beneficial when it is signed (with and without exclusivity the investment is large enough to make the incumbent more efficient ex-post and the buyer-incumbent payoff coincides with total welfare).

The following Proposition summarizes the results for both positive and negative spillovers (see also Figure 2:

Proposition 1 (No breaching) *When the incumbent invests and breaching is not possible,*

(i) *If the spillover is positive ($\lambda > 0$), the ED is signed in equilibrium iff the investment cost is not too high ($\gamma \leq \gamma^s$). ED decreases total welfare iff the investment cost is intermediate: $\gamma \in [\gamma^w, \gamma^s]$.*

(ii) *If the spillover is negative ($\lambda < 0$), the ED is signed in equilibrium iff $\lambda > 1 - \sqrt{3}$ and the investment cost is intermediate ($\gamma \in [\gamma^\circ, \gamma^s]$). In this region, if $\lambda \in [1 - \sqrt{3}, 1 - \sqrt{3}/2]$, ED is always welfare detrimental; otherwise, ED decreases total welfare iff the investment cost is not too low ($\gamma \in [\gamma^w, \gamma^s]$).*

3.3 The Incumbent invests - Breaching

Our breaching protocol can be interpreted as a fully non-cooperative procedure: if the buyer wants to breach exclusivity, a third party (i.e. the courts) establishes the damages to be paid (expectation damages). Then, the buyer is free to buy from any supplier and the incumbent and the entrant compete to supply t.

The buyer will find it profitable to breach exclusivity when the entrant is ex-post more efficient than the incumbent. If so, the incumbent will receive the expectation damages and will obtain the same payoff as in the case where breaching is not possible. The buyer will be able to buy from the more efficient entrant, and will extract the entire surplus of trading with firm E when it makes the offer, and the surplus of trading with the incumbent when the suppliers make the offer and compete. However, the latter is paid back to the incumbent in the form of damages, so that the buyer's payoff is given by $\pi_B = (v_E + \lambda x)/2 > (v_I + x)/2$. The entrant obtains the same payoff irrespective of exclusivity: in both cases, it competes with the incumbent to supply the buyer (when suppliers make the offer) and extracts rents equal to the efficiency gap with respect to the incumbent.¹⁵

¹⁵The entrant's indifference is driven by our breaching protocol which is favourable to the buyer. Under alternative breaching procedures the entrant might be better off when exclusivity is agreed upon and then breached rather than when exclusivity is not in place.

When the incumbent is ex-post more efficient, breaching does not occur and payoffs do not change as compared to the no-breaching case. Similarly for the case where no exclusive deal is signed.

Hence, given that the buyer agreed on exclusivity and given the investment level, the agents' payoffs at time 3 are given by Table 1.

3.3.1 Investment decision

Since, given the level of investment, the incumbent's payoffs are the same as in the no-breaching case, investment incentives and optimal investments are also the same:

$$x^{*ED} = \frac{1}{2\gamma}$$

$$x^{*NoED} = \begin{cases} 0 & \text{if } \gamma > \gamma^\circ \\ \frac{(1-\lambda)}{2\gamma} & \text{otherwise} \end{cases}$$

To repeat, when $\gamma > \gamma^\circ$, ED allows the incumbent to appropriate some benefit from the investment, thereby fostering it irrespective of the nature of the spillover. When $\gamma \leq \gamma^\circ$, ED prevents the incumbent from internalizing the external effect of the investment, which is detrimental for the incumbent when the spillover is positive and beneficial when it is negative. Then, in the former case ED stimulates investment, in the latter case it limits investment.

Note that when $\gamma \leq \gamma^\circ$ the possibility to breach is immaterial: both when exclusivity is in place and when it is not, the optimal investment levels are large enough to make the incumbent ex-post more efficient. Hence, the results obtained in Section 3.2.2 hold good (see also Figure 3). In what follows, we will therefore focus on the case where $\gamma > \gamma^\circ$.

3.3.2 Contracting decision ($\gamma > \gamma^\circ$)

ED as equilibrium choice

The same logic as in Segal and Whinston (2000b) applies and the ED is always signed in equilibrium.

In particular, given that the ED is in place, and irrespective of whether the contract is breached or not, the joint payoff of the incumbent and the buyer is higher when the investment is higher. When the spillover is positive, both the incumbent and the buyer benefit from higher investment. When the spillover is negative, the incumbent benefits, while the buyer is harmed from higher investment (its payoff is given by the value of trading with the entrant, which is reduced by the investment). However, since the external effect is weaker than the internal one, the incumbent's gain dominates.¹⁶

¹⁶Also in this case the assumption $b = 1/2$ is not innocent. If $b > 1/2$ the buyer's loss would be relatively more important and if the negative spillover is sufficiently strong the parties do not have an incentive to enter into an exclusive arrangement.

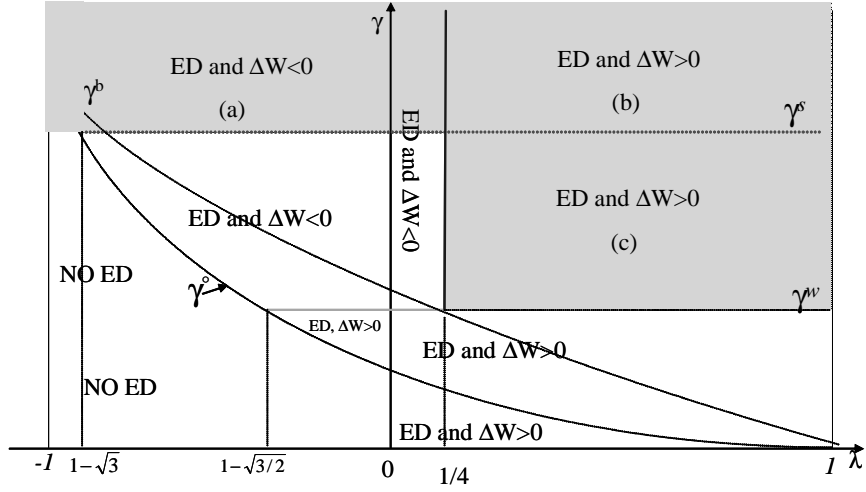


Figure 3: Equilibrium choices and welfare effects of ED when the incumbent invests and breaching is possible.

On top of this, for given investment, the joint welfare of the buyer and the incumbent is the same irrespective of exclusivity: *due to the possibility of breaching, ED does not foreclose efficient entry and the loss suffered by the buyer is equal to the incumbent's gain*. Hence, we can conclude that the joint payoff of the buyer and the incumbent is higher under ED and high investment as compared to the case when the ED is absent and investment is low.

Welfare effect of exclusive dealing

It is not trivial to deal with the welfare effects of ED because higher investment increases the joint payoff of the incumbent and the buyer but it harms the entrant. To see why, recall that absent exclusivity the incumbent does not invest. Hence, the entrant is more efficient than the incumbent and it appropriates this efficiency gap (when suppliers make the offer): $\pi_E = (v_E - v_I)/2$. ED stimulates the investment. If the incumbent becomes more efficient than the entrant (which occurs when $\gamma \in [\gamma^o, \gamma^b]$),¹⁷ the buyer has no incentive to breach the contract, entry does not occur and firm E makes zero profits. In this case ED, by fostering investment, forces the entrant to stay out of the market. If the incumbent remains less efficient than the entrant (which occurs when $\gamma > \gamma^b$), the contract is breached and the entrant makes positive profits ($\pi_E = v_E + \lambda x^{*ED} - v_I - x^{*ED}$). However, the investment reduces the

¹⁷Recall that the threshold level of the investment cost $\gamma^b \equiv \frac{(1-\lambda)}{2(v_E-v_I)}$ is such that $v_I + x^{*ED} \geq v_E + \lambda x^{*ED}$ iff $\gamma \leq \gamma^b$. If the investment cost is low enough, the investment chosen under exclusivity is large enough to make the incumbent ex-post more efficient than the entrant. Note also that $\gamma^b \geq \gamma^o$.

efficiency gap between the entrant and the incumbent,¹⁸ thereby reducing the entrant's payoff. In this latter case ED, by fostering investment, allows the buyer-incumbent coalition to extract more rents from the more efficient producer.

It follows that is not clear a priori that ED, by fostering investment, increases total welfare.

When higher investment makes the incumbent more efficient (i.e. if $\gamma \in [\gamma^\circ, \gamma^b]$), total welfare increases if (and only if) the following condition is satisfied:

$$W^{ED}(x^{*ED}) = v_I + x^{*ED} - \frac{\gamma}{2}(x^{*ED})^2 > v_E = W^{ED}(x^{*NoED}) = W^{NoED}(x^{*NoED}) \quad (6)$$

Condition 6 is satisfied iff $\gamma \leq \gamma^w$.

Recall that $\gamma^w > \gamma^\circ$ iff $\lambda > 1 - \sqrt{3/2}$ and that $\gamma^w < \gamma^b$ iff $\lambda \leq 1/4$.

When higher investment is not enough to make the incumbent more efficient than the entrant (i.e. if $\gamma > \gamma^b$), total welfare increases if (and only if) the following condition is satisfied:

$$W^{ED}(x^{*ED}) = v_E + \lambda x^{*ED} - \frac{\gamma}{2}(x^{*ED})^2 > v_E = W^{ED}(x^{*NoED}) = W^{NoED}(x^{*NoED}) \quad (7)$$

Condition (7) is satisfied if the external effect is positive and sufficiently strong, i.e. if $\lambda > 1/4$. The intuition is that the stronger the spillover the more the buyer-incumbent coalition benefits from higher investment and the less the entrant suffers from it.

To summarize (see also Figure 2),

Proposition 2 (*Breaching*) *When the incumbent invests and breaching is possible, the ED is signed whenever it stimulates the investment, i.e. irrespective of the value of γ if the spillover is positive; provided that the investment cost is high enough ($\gamma > \gamma^\circ$) if the spillover is negative. ED decreases total welfare iff $\lambda < 1/4$ and the investment cost is large enough ($\gamma > \max\{\gamma^w, \gamma^\circ\}$).*

Note that ED may be welfare detrimental even when breaching is allowed and entry deterrence is not a concern. As illustrated above, the reason is that the investment stimulated by the exclusive contract may either induce firm E to remain out of the market,¹⁹ or may be such that entry occurs but the entrant's rents are reduced. In both cases the loss suffered by the entrant may be large enough to dominate the buyer-incumbent's gain and total welfare may decrease. (Explain also that total welfare decreases because investment costs are large enough. So, even if the valuation for the entrant's good is increased by the investment, total welfare decreases.)

¹⁸When the spillover is negative and the investment reduces the value of the entrant, this is obvious. When the spillover is positive, the investment increases the value of the entrant. However, the external effect is weaker than the internal one and the efficiency gap is reduced also in this case.

¹⁹In this case it is not ED that directly forecloses entry, but it is the investment induced by ED that makes entry impossible.

Comparison with "no breaching" case.

Allowing for breaching, by removing the possibility to foreclose entry of the more efficient producer, introduces two differences. First, when ED stimulates the investment, agreeing on exclusivity becomes always profitable for the buyer-incumbent coalition. Hence, when the investment cost is large enough ($\gamma > \gamma^s$), the possibility of breaching makes the parties enter into a contract that they would not sign otherwise. When the spillover is positive and strong ($\lambda > 1/4$), such a contract is *welfare beneficial* (area (b) in Figure 3). Instead, when the spillover is either positive but weak or negative ($\lambda < 1/4$), the possibility of breaching case makes a *welfare detrimental* contract arise in equilibrium (area (a) in Figure 3).

Second, by removing the foreclosing effect, the possibility of breaching makes it more likely that a contract that would be signed irrespective of breaching is welfare beneficial. In particular, when the spillover is positive and strong enough ($\lambda > 1/4$) and the investment cost is intermediate ($\gamma \in (\gamma^w, \gamma^s)$), the possibility of breaching turns a welfare-detrimental contract into a welfare beneficial one (area (c) in Figure 3).

This last case highlights quite clearly that evaluating separately the potential pro-competitive and anti-competitive effect of ED, and then summing up the two, does not provide a correct measure of the impact of ED on welfare. More precisely, imagine that breaching is not possible and let investment costs be infinite ($\gamma \rightarrow \infty$) so that ED cannot stimulate investment. This amounts to focus on the potential anti-competitive effect of ED. As explained in Section 3.2, in our model ED would not arise in equilibrium and thus would have no effect on welfare. Imagine now that breaching is possible and thus that ED cannot foreclose efficient entry. This amounts to focus on the potential pro-competitive effect of ED. In our model, when the spillover is positive and strong enough ($\lambda > 1/4$), and the investment cost is intermediate ($\gamma \in (\gamma^w, \gamma^s)$) the ED is welfare beneficial. Differently stated, one would conclude that the anti-competitive effect is absent, while the investment-fostering one is positive, so that overall ED is welfare beneficial. However, by allowing for the anti-competitive and the pro-competitive effect to operate *simultaneously* (i.e. by ruling out breaching but reducing investment costs to a finite value) one would obtain a different conclusion: for the same parameters' values, ED would be welfare detrimental. Indeed, it is precisely the fact that ED stimulates investment that harms welfare, because it makes it possible for the parties to agree on a contract that, by deterring efficient entry, harms society.

3.4 The Buyer invests - No breaching

3.4.1 Investment decision

At time 2, the buyer chooses the level of investment in order to maximize its payoff net of investment costs:

$$\max_x \left[\Pi_B(x) - \frac{\gamma}{2} x^2 \right]$$

where $\Pi_B(x)$ is given by Table 1. The following Lemma identifies the buyer's optimal investment choice.

Lemma 2 *When the incumbent invests,*

(i) *the optimal level of investment (with and without exclusivity respectively) is given by,*

$$\begin{aligned} x^{*ED} &= \frac{1}{2\gamma}, \\ x^{*NoED} &= \frac{1+\lambda}{2\gamma}. \end{aligned}$$

(ii) *When the spillover is positive ($\lambda > 0$), ED limits the investment ($x^{*ED} < x^{*NoED}$). When the spillover is negative ($\lambda < 0$), ED stimulates the investment ($x^{*ED} > x^{*NoED}$).*
(iii) *The value of trading with the incumbent is greater than the value of trading with the entrant iff. ($v_I + x^{*NoED} > v_E + \lambda x^{*NoED}$) for $\gamma \leq (1-\lambda^2)/2(v_E - v_I) \equiv \tilde{\gamma}^o$.*

Under exclusivity the buyer reaps the benefit from investment when making the take-it-or-leave-it offer to the incumbent; i.e. with probability 1/2. The buyer does not internalize the incumbent's benefit from the investment. The equilibrium investment x^{*ED} is therefore below the welfare maximizing level $x = 1/\gamma$.

Under no exclusivity the buyer's incentives to invest depends crucially on λ . Suppose first that spillover is positive ($\lambda > 0$). When investment is low ($\gamma > \tilde{\gamma}^o$), the buyer trades with the entrant. The buyer's surplus is then equal to the value of trading with the entrant when making the offer and to the value of trading with the incumbent when the sellers make the offers. Compared to ED the buyer benefits from the investment no matter which side of the market makes the offer. The incentive to invest is therefore stronger under no ED. When investment is high ($\gamma \leq \tilde{\gamma}^o$), a similar logic applies. The buyer's surplus is now equal to the value of trading with the incumbent when making the offer and to the value of trading with the entrant otherwise. This results in the same equilibrium investment as for low investment ($\gamma > \tilde{\gamma}^o$), because we have assumed that the two sides of the market are equally likely to make the offer.

Turning to negative spillover ($\lambda < 0$), investment reduces the buyer's surplus when the buyer's equilibrium surplus is equal to the value of trading with the entrant. Due to this negative effect of investment, the buyer invests less under no exclusivity than under exclusivity.

3.4.2 Contracting decision

Positive Spillover ($\lambda > 0$) When investment is high ($\gamma \leq \tilde{\gamma}^o$), the entrant earns zero profits both under ED and no ED. Total welfare is equal to the joint profits of the buyer and the incumbent. In equilibrium the buyer and the incumbent do not enter into ED, because the investment under no ED is

closer to the efficient, welfare maximizing level ($x = (1 + \lambda)/\gamma$). Formally, the argument is,

$$\begin{aligned} & \pi_B^{NoED}(x^{*NoED}) + \pi_I^{NoED}(x^{*NoED}) - \frac{\gamma(x^{*NoED})^2}{2} = \\ & \pi_B^{ED}(x^{*NoED}) + \pi_I^{ED}(x^{*NoED}) - \frac{\gamma(x^{*NoED})^2}{2} > \\ & \pi_B^{ED}(x^{*ED}) + \pi_I^{ED}(x^{*ED}) - \frac{\gamma(x^{*ED})^2}{2}, \end{aligned}$$

where the last in equality follows from $x^{*ED} < x^{*NoED} < (1 + \lambda)/\gamma$. The contracting choice imposes no externalities on entrant, and it is efficient. Whinston and Segal (2000b) consider a game with more general payoff functions. For this reason, they are only able show the local result that there will not be full exclusive dealing when the incumbent is more efficient than the entrant (i.e., $\gamma \leq \tilde{\gamma}^o$). However, the effects underlying this result are the same as in our model.

Consider instead low investments ($\gamma > \tilde{\gamma}^o$) where ED protects the incumbent from competition from the more efficient entrant. Absent investment, no exclusivity is the equilibrium outcome, because the buyer's loss from exclusivity outweighs the incumbent's gain. With investment, exclusivity entails an additional cost to the coalition of the buyer and the incumbent. The investment under no ED maximizes the joint profits of the buyer and the incumbent whereas the investment under ED is too low from point of view of joint profits. Since exclusionary and investment motives both favor no ED, this is the equilibrium outcome.

Negative Spillover ($\lambda < 0$) Suppose first that investment is high ($\gamma \leq \tilde{\gamma}^o$). The buyer invests more under exclusivity, which benefits the incumbent. Using the same type of argument as Segal and Whinston (2000b), it is possible to show that ED is the equilibrium outcome:

$$\begin{aligned} & \pi_B^{ED}(x^{*ED}) + \pi_I^{ED}(x^{*ED}) - \frac{\gamma(x^{*ED})^2}{2} > \\ & \pi_B^{ED}(x^{*NoED}) + \pi_I^{ED}(x^{*NoED}) - \frac{\gamma(x^{*NoED})^2}{2} = \\ & \pi_B^{NoED}(x^{*NoED}) + \pi_I^{NoED}(x^{*NoED}) - \frac{\gamma(x^{*NoED})^2}{2}, \end{aligned}$$

where the last equality holds because the entrant earns zero profits also under no exclusivity. The coalition of the buyer and the incumbent makes the welfare maximizing contracting choice, because welfare coincides with the joint profits of the buyer and the incumbent.

Suppose instead that investment is low ($\gamma > \tilde{\gamma}^o$). An exclusive dealing contract stimulates investment and shelters at the same time the incumbent from competition. Nevertheless, it eliminates the buyer's possibility of trading with the entrant. If trading with entrant under no exclusivity generates higher value

than trading with the incumbent under exclusivity, this entails a cost for the coalition of the buyer and the incumbent. ED arises in equilibrium iff.

$$\pi_{B+I}^{ED}(x^{*ED}) > \pi_{B+I}^{NoED}(x^{*NoED}) \iff \gamma < \frac{2 - 2\lambda - \lambda^2}{4(v_E - v_I)} \equiv \tilde{\gamma}^s,$$

where $\tilde{\gamma}^s > \tilde{\gamma}^o$ for $\lambda < 0$. ED is the welfare maximizing choice iff.

$$W^{ED}(x^{*ED}) > W^{NoED}(x^{*NoED}) \iff \gamma < \frac{4 - 2\lambda - 3\lambda^2}{8(v_E - v_I)} \equiv \tilde{\gamma}^w,$$

where $\tilde{\gamma}^o < \tilde{\gamma}^w < \tilde{\gamma}^s$ for $\lambda < 0$. The buyer and the incumbent have too strong an incentive to enter into ED, because they do not consider entrant's profit under no ED. For $\lambda \in (\tilde{\gamma}^w, \tilde{\gamma}^s]$ welfare reducing ED is therefore the equilibrium outcome. We find again that ED can be welfare reducing although it stimulates investment. The intuition is, as spelled out above, that the additional investment under ED increases the buyer's and the incumbent's joint benefit from ED. Hence ED can be privately optimal but socially suboptimal.

The following proposition summarizes the analysis for the case of buyer investment.

(No breaching) When the buyer invests and breaching is not possible,

- (i) If the spillover is positive ($\lambda > 0$), no ED stimulates investment by the buyer. No ED is signed in equilibrium, which is the welfare maximizing contracting choice.
- (ii) If the spillover is negative ($\lambda < 0$), ED stimulates investment by the buyer. The ED is signed in equilibrium iff investment cost is intermediate ($\gamma \in [\tilde{\gamma}^o, \tilde{\gamma}^s]$). In this region, ED decreases total welfare iff the investment cost is not too low ($\gamma \in [\tilde{\gamma}^w, \tilde{\gamma}^s]$).

Remark 3 *The assumption $b = 1/2$ is not innocuous. If $b < 1/2$ and the negative spillover is sufficiently weak ($\lambda > -(1 - 2b)/b$), ED is always welfare improving when it occurs in equilibrium. The reason is that, absent exclusivity, the buyer's payoff is formed by two components: when the buyer makes the offer (which occurs with probability b), it extracts the value of trading with the most efficient firm; when suppliers make the offer and compete (which occurs with probability $1 - b$), the buyer extracts the value of trading with the least efficient firm. When $b < 1/2$ the second component is relatively more important for investment incentives than the first component. Hence for low investment levels, where the incumbent is least efficient, the marginal return on investment is higher than for high investment levels where investment reduces the value of trading with the less efficient entrant. Due to this discontinuity in the marginal return on investment, which occurs at $x = (v_E - v_I)/(1 - \lambda)$, the buyer invests under no ED exactly enough to make the entrant and the incumbent equally competitive. Since the entrant earns zero profits under ED and no ED, social welfare coincides with the joint profit of the buyer and the incumbent. The contracting decision is therefore welfare maximizing.*

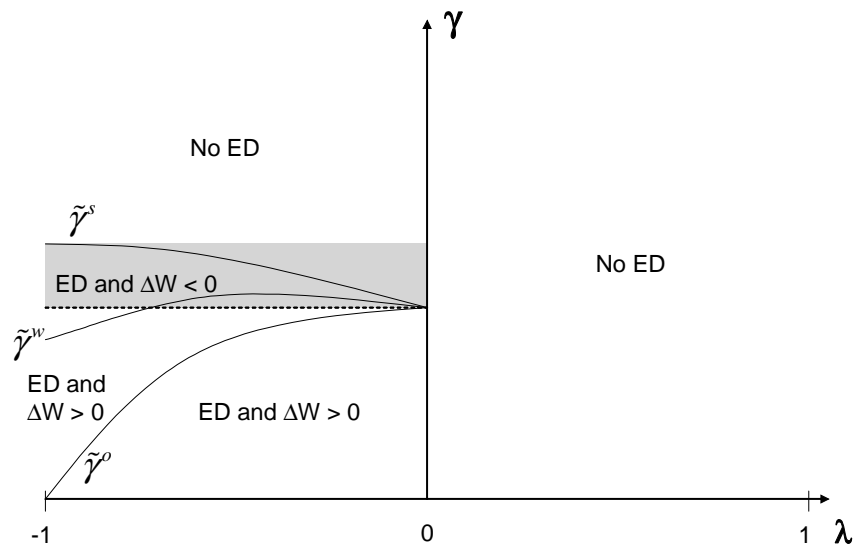


Figure 4: The equilibrium outcome when no breaching is possible. ΔW indicates whether ED is welfare enhancing ($\Delta W > 0$) or reducing ($\Delta W < 0$). The shaded area indicates the region of the parameter space for which the choice switches from ED to no ED when breaching the ED contract is possible.

3.5 The Buyer Invests - Breaching

3.5.1 Investment decision

When breaching an ED agreement is possible, the buyer trades with the most efficient supplier. If investment is low, the buyer foresees that trade will occur with the entrant and that the benefit from investment is $\lambda x/2$, see Table 1. The incentives to invest is reduced compared to a situation with no breach where the benefit from investment is $x/2$.

This result in the following investment behavior:

Lemma 3 *When the buyer invests and breaching is possible,*

(i) *If the spillover is positive ($\lambda \geq 0$), the buyer invests*

$$\begin{aligned} x^{*ED} &= \begin{cases} \frac{\lambda}{2\gamma} & \text{if } \gamma \geq \tilde{\gamma}^\diamond \equiv \frac{1-\lambda^2}{2(v_E-v_I)} \\ \frac{1}{2\gamma} & \text{otherwise} \end{cases} \\ x^{*NoED} &= \frac{1+\lambda}{2\gamma}. \end{aligned}$$

(ii) *If the spillover is negative ($\lambda < 0$), the buyer invests*

$$\begin{aligned} x^{*ED} &= \begin{cases} 0 & \text{if } \gamma \geq \tilde{\gamma}^\diamond \equiv \frac{1}{2(v_E-v_I)} \\ \frac{1}{2\gamma} & \text{otherwise} \end{cases} \\ x^{*NoED} &= \frac{1+\lambda}{2\gamma}. \end{aligned}$$

Proof. To be written. ■

Notice that the buyer might not invest at all under ED if spillover is negative. The reason is that the buyer's payoff depends on the value of trading with the entrant. If investing enough to make the incumbent more efficient than the entrant is not profitable, the buyer maximizes instead the value of trading with the entrant by choosing $x = 0$.

Similar to the case of buyer investment, the analysis only changes for $\gamma > \tilde{\gamma}^\diamond$ where an ED contract is breached. In what follows, we will therefore focus on this case.

3.5.2 Contracting decision ($\gamma > \tilde{\gamma}^\diamond$)

For positive spillover ($\lambda > 0$) the buyer and the incumbent do not enter into ED. Compared to a situation of no breach, the investment x^{*ED} is reduced. The investment under ED is further away from the level that maximizes the joint profit of the buyer and the incumbent, x^{*NoED} . It follows that the possibility of breach reduces the profits under ED and that no ED continues to be the equilibrium outcome.

For negative spillover ($\lambda < 0$), the buyer and the seller do not enter into ED:

$$\begin{aligned} \pi_B^{NoED}(x^{*NoED}) + \pi_I^{NoED}(x^{*NoED}) - \frac{\gamma(x^{*NoED})^2}{2} &> \\ \pi_B^{NoED}(x^{*ED}) + \pi_I^{NoED}(x^{*ED}) - \frac{\gamma(x^{*ED})^2}{2} &= \\ \pi_B^{ED}(x^{*ED}) + \pi_I^{ED}(x^{*ED}) - \frac{\gamma(x^{*ED})^2}{2}. \end{aligned}$$

The first inequality follows from $x^{*NoED} \geq x^{*ED}$, $\partial\pi_I^{NoED}(x)/\partial x \geq 0$, and from a revealed preference argument. The second equality holds, because ED for given a level of investment shifts rents from the buyer to the incumbent without affecting their joint surplus.

The next proposition summarizes the analysis of the setup where breaching is possible.

Proposition 3 (*Breaching*) *When the buyer invests, breaching is possible, and $\gamma > \tilde{\gamma}^\diamond$, the ED is never signed.*

Comparison with "no breaching" case. The possibility of breaching reduces the buyer's incentive to invest whenever breach occurs in the subgame where an ED is signed. For positive spillover, this does not change the equilibrium outcome. The buyer and the incumbent prefer no ED without breaching and with breaching profits from ED is only reduced further. For negative spillover, breaching reduces the scope for ED, because the buyer invests less. For $\gamma \in (\tilde{\gamma}^\diamond, \tilde{\gamma}^s]$ the contracting decision changes from ED to no ED when introducing the possibility of breaching an ED contract. This corresponds to the shaded area in Figure 4. For $\gamma \in (0, \tilde{\gamma}^\diamond]$ the ED is not breached, and the analysis remains the same.

3.6 Discussion: Comparison with Segal and Whinston (2000b)

First, in Segal and Whinston (2000b) the exclusive contract can be breached. Then, a situation where ED is welfare detrimental because it forecloses *efficient* entry cannot arise in their setting.

Second, in Segal and Whinston (2000b) after the exclusivity and investment decisions have been taken, total surplus is shared according to a cooperatively approach. Instead, in our model, when we allow for breaching, both the price at which the good is traded and the breaching outcome are pinned down *non-cooperatively*. This leads to two differences in results. First, the irrelevance result does not hold in our setting. Second, when the investment has substitutable effects (i.e. $\lambda < 0$), Segal and Whinston (2000b) obtains that ED always limits investment. The reason is that absent ED, the investment benefits the incumbent both through the internal effect and the external negative effect, whereas under exclusivity the external effect is not internalized. Instead, we obtain that ED may also stimulate the investment when $\lambda < 0$. This is due to

the fact that, absent exclusivity, when the investment cost is sufficiently large that the entrant is ex-post more efficient, the incumbent does not sell ex-post and thus does not enjoy any benefit from the investment (either internal or external). Under exclusivity, instead, the incumbent obtains a strictly positive payoff which is increased by the internal effect of the investment, thereby having an incentive to invest.

Third, Segal and Whinston (2000b) adopts a very general framework which does not allow to weigh up the payoffs of the different agents when they move into opposite directions. For instance, when $\lambda > 0$, in order to draw clear-cut welfare conclusions, Segal and Whinston (2000b) either assume that there exists a competitive supply of entrants (so that the payoff of the entrant is always zero, and total welfare coincides with the joint welfare of the incumbent and the buyer) or impose sufficient conditions such that also the entrant benefits from higher investment. In other words, they rule out the possibility that the entrant is harmed by the investment (they state this case can arise, but do not identify conditions for it). Instead, our model explicitly accounts for the possibility that ED can be welfare detrimental precisely because it harms the entrant.

When $\lambda < 0$, both in our model and in Segal and Whinston (2000b), the internal effect of the investment benefits the buyer while the external effect has a negative impact on the buyer. In our model, from the assumptions that the internal effect is stronger than the external one (i.e. $\lambda > -1$) and that $b = 1/2$, it follows that the negative effect is weak enough and also the buyer benefits from higher investment. Hence, no exclusive dealing is the equilibrium outcome. Segal and Whinston (2000b), in order to limit the extent of the negative external effect on the buyer restrict the parameter ϵ which indicates the degree of exclusivity to be sufficiently close to 1. The reason being that starting from full exclusivity, a reduction in the degree of exclusivity increases investment. If such a reduction is *small*, the additional investment increases the value of trading with the incumbent, but it only has a small effect on the value of trade with the entrant. Hence, also the buyer benefits from the increase in investment, and the buyer-incumbent coalition agrees on the reduction in exclusivity. They conclude that *full* exclusivity is not optimal, we conclude that no exclusive deal is signed in equilibrium, but the very essence of the results is the same.

However, if the reduction in the degree of exclusivity is *large*, the buyer can be harmed by higher investment and it is not a priori obvious that the buyer and the incumbent agree to reduce exclusivity further. Again they do not provide explicit conditions for this to be the case, but the buyer and the incumbent might decide not to reduce exclusivity further in order to limit investment. This possibility arises more clearly in our setting (see remark 2), when $b < 1/2$ and the negative external effect is sufficiently strong. In such a case, the buyer is harmed by the investment and its loss dominates the incumbent gains. Hence, the exclusive deal is signed in equilibrium precisely because it *limits* the investment.

4 Conclusive Remarks

In this paper we study a model where ED can both promote investment and foreclose a more efficient supplier. This provides interesting insights on the welfare effects of exclusive dealing arrangements.

Investment promotion is usually regarded as a pro-competitive effect of exclusive dealing, to be balanced against potential foreclosure. Our paper shows that a contract that *forecloses* a more efficient supplier may be signed *precisely because it fosters investment*. Absent the investment effect, the contract would not be signed and foreclosure would not be a concern.

For this reason, considering potential foreclosure and investment promotion in isolation and then summing them up may not be a suitable approach in order to evaluate the net effect of exclusive deal contracts. Our paper shows that taking into account the *interaction* between these two effects may lead to very different conclusions.

Also, our analysis shows that contrary to earlier findings, notably Segal and Whinston (2000b), exclusive dealing may encourage investment even if the latter is specific to the relation between the contracting parties and does not exert any external effect. More precisely, our paper shows that Segal and Whinston's *Irrelevance Result* does not extend to a setting where breaching is not possible and, under breaching, it is sensitive to the way the bargaining protocol is modeled (see also DeMeza and Selvaggi, *forthcoming*).

Further, our paper highlights that the identity of the investor and the sign of the external effect are important determinants of the effect of exclusive dealing. In particular, when the incumbent invests, exclusive dealing is more likely to foster investment and to increase welfare if the investment has a *positive* external effect, i.e. if it increases the value of trade between the buyer and the rival supplier. Instead, when the buyer is the investing party, investment promotion and welfare increase are more likely when the external effect is negative, i.e. if higher investment deteriorated the value of trade between the buyer and the rival supplier. In both cases, the investment increases spurred by exclusive dealing must be large enough in order to remove or dominate potential foreclosure, i.e. investment costs must be low enough.

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