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## Exclusive Dealing: The Interaction between Foreclosure and Investment Promotion

By **Chiara Fumagalli**, Bocconi University, CSEF and CEPR

**Massimo Motta**, Bologna University and CEPR

**Thomas Rønde,** Copenhagen Business School and CEPR

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## Summary

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 very 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 therefore invites a more cautious attitude towards accepting possible investment promotion arguments as a defence for ED.

**Keywords:** Monopolization Practices, Vertical Agreements

**JEL Classification:** L12, L40, L42

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*Address for correspondence:*
Chiara Fumagalli
Bocconi University
Department of Economics (DEP)
Via Gobbi 5
20136 Milan Italy
E-mail: chiara.fumagalli@uni-bocconi.it

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Fondazione Eni Enrico Mattei
Corso Magenta, 63, 20123 Milano (I), web site: www.feem.it, e-mail: working.papers@feem.it

# Exclusive dealing: the interaction between foreclosure and investment promotion*

Chiara Fumagalli
Univ. Bocconi, CSEF and CEPR.

Massimo Motta
Univ. di Bologna and CEPR.

Thomas Rønde
Copenhagen Business School and CEPR

March 19, 2009

**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 very 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 therefore invites a more cautious attitude towards accepting possible investment promotion arguments as a defence for ED.

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# 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.

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 contracts may serve anticompetitive purposes, but by now there are a number of papers which have shown that exclusive dealing (ED) may deter efficient entry and which analyze the conditions under which this can occur. This literature on what we would call "*foreclosing effect*" of ED is composed among others by the contributions of Aghion and Bolton (1985), Rasmusen, Ramseyer and Wiley (1991), Bernheim and Whinston (1998), Segal and Whinston (2000a), Fumagalli and Motta (2006), Simpson and Wickelgren (2007).

On the other hand, there is also consensus that exclusive contracts may in certain circumstances serve efficiency-enhancing ends by protecting the relation-specific investment of the exclusive-right holder against opportunistic hold-up (think for instance of a manufacturer that invests in order to improve the services of a common retailer, thereby failing to entirely appropriate the benefits of its investment). This "*investment promotion effect*" of ED has been analyzed by Besanko and Perry (1993), Segal and Whinston (2000b), De Meza and Selvaggi (2007), Groh and Spagnolo (2004) and Vasconcelos (2008).

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 policy 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 foreclosing effect and the investment promotion effect of exclusive contracts against each other.

However, the current theory does not facilitate this task because it analyses the two potential effects of ED in *isolation*. More precisely, the literature on investment promotion abstracts from the risk of foreclosure by assuming that the initial contract is renegotiable,[3] while the literature on potential forecloure (which instead assumes that the initial contract is not renegotiable) does

[1] Among 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)].

[2] U.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). The European Commission has recently signalled its intention to move towards a rule of reason approach. See the recent *Guidance on the Commission's Enforcement Priorities in Applying Article 82 EC Treaty to Abusive Exclusionary Conduct by Dominant Undertakings*, December 2008.

[3] The approach used by Besanko and Perry (1993) is slightly different because foreclosure issues are avoided by assuming that manufacturers face perfectly elastic supply of potential retail outlets.

not model the possibility that the parties involved in the exclusive contract can engage in relation-specific investment.

The purpose of this paper is to contribute to fill this gap by offering a simple but unifying framework where exclusivity may give rise to *both* inefficient foreclosure and investment promotion. We show that the interaction between these two effects provides interesting insights on the welfare effects of exclusive dealing contracts.

To this aim, we consider a model where an incumbent supplier offers a buyer an exclusive contract which *cannot be renegotiated*. If signed, this contract commits the buyer not to purchase from an alternative supplier. After exclusivity is signed or rejected, *(non-contractible) investment decisions* are taken. An investment - which can be made by either the incumbent or the buyer - increases the value of trade between the incumbent and the buyer, and may also have an external effect, i.e. it may increase or decrease the value of the transaction between the buyer and the entrant supplier. Then, price decisions are taken. If no exclusive contract has been signed, the incumbent and the rival supplier compete to serve the buyer.

In our model, absent investments there is none of the usual features which are known to result in foreclosure of efficient entrants. Instead, we show that the promotion of investments - usually considered a welfare beneficial effect of exclusive contracts - might make them exclusionary. Indeed, a contract that *forecloses* a more efficient supplier may be signed *precisely because it fosters investment*. Therefore, we identify here a new reason why exclusive dealing might be an exclusionary practice.

Let us be more precise. In our setting, absent any effect of ED on investment, an exclusive contract which leads to inefficient foreclosure would not be signed in equilibrium (in other words, the Chicago School critique applies). The reason is that the contract, if signed, benefits the incumbent but causes a loss to the buyer. Since the lowest compensation that the buyer requires to sign is larger than the incumbent's gain, it follows that the incumbent could never elicit the buyer's acceptance in a profitable way. Instead, when one takes into account investment promotion, it turns out that an exclusive contract which leads to inefficient foreclosure is signed. The reason is that investment promotion, by increasing the value of trade between the incumbent and the buyer, mitigates the buyer's loss due to exclusivity and expands the incumbent's gain. If this effect is sufficiently strong, the buyer and the incumbent have a private incentive to agree on exclusivity. However, investment promotion may be too weak to make the incumbent more efficient than the rival supplier and the decision to agree on exclusivity, by foreclosing the more efficient producer, may be welfare detrimental.

We also show that considering the risk of foreclosure and investment promotion in isolation, *disregarding their interaction*, does *not* provide a *correct measure of the net effect of ED on welfare*. Indeed, we show that if one focuses on the risk of foreclosure abstracting from investment promotion (i.e. if one assumes that the exclusive contract is not renegotiable and that it does not affect investments), it would conclude that ED does not raise any concern because it would not be signed at equilibrium. Also, if one focuses on investment promotion abstracting from potential foreclosure (i.e. if one allows ED to stimulate investment and to be renegotiated), under some parameter configurations it would conclude that ED is welfare beneficial. Hence, evaluating separately the risk of foreclosure and investment promotion and 'summing them up' would lead to conclude that the overall effect of ED on welfare is positive. However, if one allows for foreclosure and investment promotion to operate simultaneously (i.e. if one allows ED to promote investment but rules out

renegotiation) it would obtain the opposite conclusion: for the same parameter configurations, ED would be welfare detrimental.

Finally, we show that the *identity of the investor* and the *sign of the external effect* are important determinants of the welfare effect of exclusive dealing. In particular, if the incumbent invests, it is more likely that investment promotion facilitates inefficient foreclosure when the investment has a *positive* external effect, i.e. when it increases the value of trade between the buyer and the rival supplier. Instead, if the buyer is the investing party, investment promotion leads more likely to foreclosure when the external effect is negative. Finally, disregarding the interaction between investment promotion and foreclosure is more likely to be misleading when the incumbent invests and the external effect is positive and sufficiently strong.

As mentioned above, our paper is related both to the literature on ED and investment promotion and to the literature on ED and foreclosure, building a bridge between the two. The paper closest to ours is probably Segal and Whinston (2000b), which shows in a very general framework that the investment-stimulating role of ED depends crucially on the nature of the external effect and the identity of the investor. The main difference between our paper and theirs is that central to our analysis is the case where the exclusive dealing contract is not renegotiable, while renegotiation is feasible in Segal and Whinston (2000b).[4] This leads to the following differences in predictions. First, in Segal and Whinston (2000b) ED does not play any role in promoting investment when the external effect is absent (denoted as the Irrelevance Result), while this is not the case in our paper.[5] Second, we find that ED may be welfare detrimental also because investment promotion may facilitate foreclosure and not only because it leads the buyer-incumbent coalition to undertake socially wasteful investment with the aim of extracting more rents from the entrant (a possible effect which has been highlighted also by Spier and Whinston 1995 in a model which introduced renegotiation in the setting of Aghion and Bolton 1987). Overall, we regard our analysis as complementary to theirs.

More generally, our paper is related to the law and economics literature, initiated by Shavell (1980), which studies the impact of both privately stipulated and court-imposed contractual damages on investment incentives.[6]

Finally, our paper is related to the literature on hold-up and vertical integration.[7] Indeed, both vertical integration and exclusive dealing mitigate (or solve) the hold-up problem by affecting the disagreement payoffs that the agents obtain *ex-post* when trade conditions are to be established.

[4]We also study the case where the initial contract can be renegotiated (obtaining results very similar to Segal and Whinston 2000b) but such a case is not the focus of our paper and is functional to show that disregarding the interaction between investment promotion and foreclosure may be misleading.

[5]Some recent contributions provide an alternative explanation of why ED may affect investment even in the absence of external effects. De Meza and Selvaggi (2007) emphasize that the Irrelevance Result depends on some properties of the renegotiation procedure assumed by Segal and Whinston (2000b). Vasconcelos (2008) highlights the role of asymmetric information at the contracting stage. In such an environment, absent exclusivity the better informed principal can extract surplus from the agent through informative signalling, but at the cost of distorting the agent's investment incentives. Exclusivity allows to resolve such conflict and restores efficiency of the investment decision. Finally, Groh and Spagnolo (2004) emphasizes that exclusivity may affect the parties' loss to a delayed agreement in the subsequent negotiation for terms of trade, which in in turn affects their patience, hence their relative bargaining power and thus the incentives to invest.

[6]See, among the others, also Leitzel (1989), Chung (1992), Spier and Whinston (1995) and Edlin and Reichelstein (1996).

[7]See the seminal contributions by Grossman and Hart (1986) and Hart and Moore (1990). See also Hart (1995) for a comprehensive exposition.

This affects the allocation of *ex-post* surplus, which in turn determines the *ex-ante* investment incentives. ED exerts such an effect by depriving the buyer of the possibility to trade with alternative suppliers. Vertical integration does not prohibit external trade, but it assigns control rights over assets to one of the involved parties, thereby reducing the payoff obtained by the other party in case of external trade.

The paper proceeds as follows. Section 2 presents the model and discusses its assumptions. Section 3 presents a simple example which aims at illustrating why considering jointly the risk of foreclosure and investment promotion gives rise to new insights. Section 4 represents the central part of our paper and identifies under which conditions ED, by promoting investment, makes inefficient foreclosure more likely. Section 5 highlights under which circumstances disregarding the interaction between investment promotion and the risk of foreclosure leads to misleading conclusions. Section 6 will discuss a few extensions, while Section 7 will conclude the paper.

## 2 The model

We consider a model with three agents, a buyer ($B$), an incumbent seller ($I$) and an alternative supplier (or potential entrant, $E$). At date 0, the buyer and the incumbent write a contract. At the initial contracting stage, $B$ and $I$ can sign an exclusive dealing contract which prohibits $B$ from trading with $E$. We assume that the initial contract is *incomplete*, in the sense that it cannot specify the terms of future trade because the nature of trade is hard to describe in advance. The *only* possible term in the initial contract, aside a lump-side payment, is the exclusivity provision. In other words, the only fact that can be described *ex-ante* and verified *ex-post* is that $B$ does not conduct any trade with another seller.[8]

At date 1, after the contract is signed, but before trade, either $I$ or $B$ may undertake *non-contractible* investment which affects the value of *ex-post* trade.[9]

Finally, at date 2 trade occurs.[10]

Central to our analysis is the case where the exclusive dealing contract *cannot be renegotiated* before trade takes place.[11] We make this assumption because we want to assess the welfare effects of ED in a setting where investment promotion and the risk of inefficient foreclosure can arise

[8]This form of contract incompleteness is typically assumed in the literature investigating either potential foreclosure of ED (see for instance Rasmusen et al. 1991 and Segal and Whinston 2000a) or investment promotion (see Segal and Whinston 2000b and De Meza and Selvaggi 2007). This assumption, albeit extreme, captures the difficulty of contractually specifying all aspects of performance and allows to study the effects of exclusivity and the interaction of foreclosure and investment promotion in the simplest possible setting where incompleteness is present.

[9]If the investment could be specified directly in the initial contract, exclusivity would not be necessary for promoting investment.

[10]We do not model explicitly an entry decision, and assume instead that firm $E$ can always supply the market if profitable. Assuming positive entry costs and letting the entrant decide on entry after investment decisions are taken would not add further insights to the analysis.

[11]The existence of transaction costs may explain why renegotiating the exclusive contract may be too costly. For instance, it may require legal services, or it may involve lengthy procedures and uncertain court decisions (which might imply that the buyer will be left without consuming the good until the court's judgment has been made or the new agreement has been found). Moreover, the negotiation activity itself may involve substantial effort, time and resources and be quite costly. Researchers usually treat renegotiation as either costless or prohibitively costly. See Schwartz and Watson (2004) for a recent paper where costs of contracting and renegotiation can take intermediate values and the contracting parties can themselves influence these costs. Also, a technological commitment that eliminates the possibility to trade with $E$ can make renegotiation impossible.

simultaneously. We relax this assumption in Section 5.

For simplicity, we assume that the buyer demands at most one unit of a good produced either by $I$ or $E$. The two suppliers are equally efficient (their marginal costs of production are normalised to zero: $c_E = c_I = 0$) but, absent investments, the buyer's valuation for $E$'s product is larger: $v_E > v_I$.

If either $B$ or $I$ invests $x$ into their relationship, which entails a cost $C(x) = (\gamma x^2)/2$, $B$'s valuation for the incumbent's product becomes $v_I + x$.[12] However, the investment may also have an *external* effect, i.e. it may affect the value of the relationship between $B$ and $E$ which becomes $v_E + \lambda x$. The parameter $\lambda \in [-1, 1)$ measures the intensity of the external effect. When $\lambda = 0$, only the internal value of the relationship between $I$ and $B$ is affected. When $\lambda > 0$, the investment increases not only the internal value of the transaction, but *also* the value of trade between $B$ and $E$. This is the case that Segal and Whinston (2000b) denote as *complementary* investment effects. Consider, for instance, the case of a manufacturer that invests in technical training of a retailer in order to improve the quality of the retailing service. Such an investment may benefit also the relationship of the retailer with other manufacturers of similar products. Instead, when $\lambda < 0$, an investment that increases the internal value *deteriorates* the value of the external relationship. This case is denoted by Segal and Whinston (2000b) as *substitutable* investment effects. For instance, an investment that improves compatibility between a seller's input and a buyer's equipment and production processes or that tailors the buyer's inter-organizational communication systems to those of a particular input supplier may make it more costly to use alternative inputs. Similarly, a retailer may focus its promotional effort on a specific product, with detriment to other products that it distributes.[13]

Finally, we model pricing decisions at date 2 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 makes 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.[14]

## 3 A simple example

Before solving the model, let us propose a simple example which captures some features of the game we analyse more rigorously below and which illustrates the main intuition why combining foreclosure and investment promotion of exclusive dealing may give rise to new insights.

Consider first a situation where - like in the literature on the 'foreclosing effect' of ED - *investment is not possible* (or is infinitely costly) and the exclusive dealing contract *cannot be renegotiated* (Case I in Figure 1). Absent exclusivity (denoted as NoED), trade occurs with the more efficient supplier (firm $E$), generating total surplus $v_E$. The buyer appropriates $(v_E + v_I)/2$

[12] We do not consider explicitly investment decisions by $E$. However the valuation of $E$'s good can be thought of as determined by an entrant's exogenous investment.

[13] We constrain $\lambda$ to be smaller than 1 because we find it reasonable that the investment in the internal relationship does not exert stronger beneficial effects on the external one. We constrain $\lambda$ to be larger than $-1$ for simplicity's sake, but this assumption does not affect the results in a significant way. We will discuss when allowing for $\lambda$ smaller than $-1$ leads to additional insights.

[14] The only restriction that we need to impose is the exclusion of the extreme cases where neither the buyer nor the incumbent has the power to decide prices (i.e. where $b = 1$ or $b = 0$). In those cases, one would trivially obtain that ED can never strengthen investment incentives.

out of this value: When it can make the offer - which occurs with probability 1/2 - it requires the good for free from firm $E$. When suppliers make the offer, asymmetric Bertrand competition takes place. The incumbent's best deal is to sell the good for free, which generates value $v_I$. Firm $E$ can beat this offer leaving the buyer with the same payoff $v_I$ and appropriating the additional value $(v_E - v_I)$ that its good generates. In both cases the incumbent does not sell and its payoff is zero. The agents' payoffs absent exclusivity are then the ones indicated in Figure 1 (Case I, right panel). Under exclusivity (denoted as ED), trade with firm $E$ is not possible. The total value that can be generated is $v_I$ and is shared evenly between the buyer and the incumbent as indicated in the Figure. It can be easily seen that while the buyer is harmed by the introduction of exclusivity, as it loses the possibility to trade with the more efficient producer and to benefit from suppliers' competition, the incumbent benefits from it. However, the incumbent's gain is smaller than the buyer's loss, which implies that the incumbent cannot profitably compensate the buyer in order to elicit acceptance on exclusivity. This is an alternative way to state the Chicago School result that an exclusive dealing contract that forecloses a more efficient supplier would not be signed in equilibrium. Hence, in this situation *ED does not raise any concern.*

Consider now a situation where it is *still impossible to renegotiate* the exclusive dealing contract, but where the incumbent *can invest* into the relationship with the buyer at an arbitrarily low cost $\varepsilon$. Assume that absent ED the incumbent chooses not to invest ($x^{*NoED} = 0$) so that total welfare is still $v_E$, while under ED the investment is undertaken ($x^{*ED} > 0$).[15] As shown by Figure 1 (Case II), the investment promoted by ED, by increasing the value of trade with the incumbent which becomes $v_I + x^{*ED}$, increases both the buyer's and the incumbent's payoff under exclusivity. This mitigates the buyer's loss due to the introduction of exclusivity and expands the incumbent's gain, as compared to the situation where investment promotion is not taken into account. If investment promotion is large enough, as in Figure 1 (Case II), it becomes profitable for the incumbent to elicit the buyer's acceptance. However, if investment promotion is insufficient to make the incumbent ex-post more efficient (i.e. if $v_I + x^{*ED} < v_E$ as in the Figure), the buyer and the incumbent have a private incentive to agree on a contract which, by prohibiting trade with a more efficient supplier, is *welfare detrimental.*

The comparison between these situations illustrates the intuition for our first result: the fact that ED fosters investment does not necessarily make inefficient foreclosure less of a concern. Indeed, a contract which leads to inefficient foreclosure may be signed *precisely because it promotes investment.*

Finally, consider a situation - in line with the literature on 'investment promotion' - where *investment is possible* and the exclusive dealing contract *can be renegotiated.* Assume that the renegotiation procedure is such that investment incentives are the same as in the case where renegotiation is not possible: absent exclusivity the incumbent does not invest and total surplus is $v_E$, while under exclusivity the incumbent invests the same amount $x^{*ED}$. What makes a difference is that renegotiation removes foreclosure, i.e. when the incumbent is ex-post less efficient than firm $E$, trade with the latter is possible even though the ED is in place. This has two implications. First, it allows to benefit from the additional surplus created by the more efficient supplier, leaving the negotiating parties at least as well off as in the case where the contract is complied. In turn, this (weakly) reduces the buyer's loss due to the introduction of exclusivity, and (weakly) increases

[15] The model will endogenise the investment choice and the effect of ED on investment incentives and will identify the precise conditions under which the situation illustrated in the example arises.

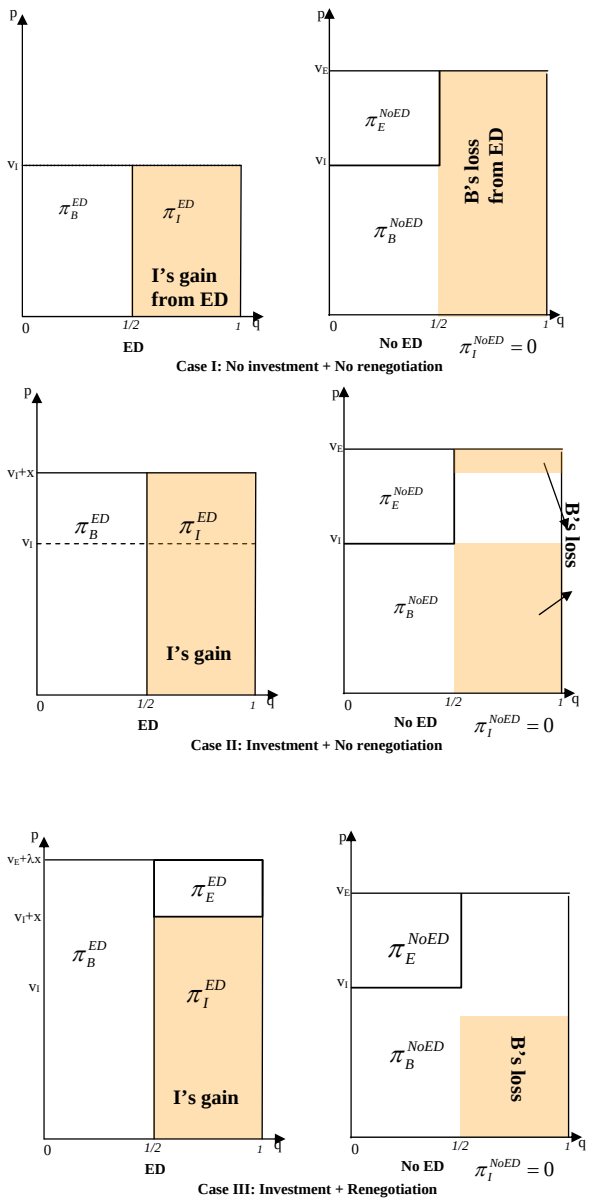


Figure 1: Gains and losses from Exclusive Dealing (ED)

the incumbent's gain compared to the case of no renegotiation, thereby making even easier for the incumbent to elicit acceptance on exclusivity.[16] Secondly, and more importantly, the fact that renegotiation allows to trade with firm $E$ implies that society can take advantage of the investment promoted by ED *also through the external effect* which, when positive, *increases the value of such trade*. Hence, ED turns out to be welfare beneficial ($v_E + \lambda x^{*ED} - \varepsilon > v_E$), as Figure 1 (Case III) shows.

These three cases illustrate the intuition for our second result. In this example, one who focuses - as in Case I - on the risk of foreclosure disregarding investment promotion, would conclude that ED does not serve any anti-competitive purposes. One who focuses - as in case III - on investment

[16]Section 5.1, where we analyse the case of feasible renegotiation, will clarify why agents' payoffs are the ones indicated in Figure 1 (Case III).

promotion disregarding foreclosure, would conclude that ED is welfare beneficial. *Hence, considering these effects separately and 'summing them up' would lead to a positive evaluation of the effects of ED. Instead, considering the interaction between foreclosure and investment promotion would lead to the opposite conclusion.*

Of course, this example is very stylised, and in particular the investment choice and the effect of ED on investment incentives were all taken as exogenous. We now turn to our formal model where we endogenise these elements and thus we study more rigorously the effects at play in a setting where exclusive clauses can have both foreclosure and investment promotion effects.

# 4 When investment promotion facilitates foreclosure

In this section we assume that the exclusive dealing contract is *not renegotiable*. Section 4.1 will illustrate the case where the incumbent is the investing agent. Section 4.2 will show that the main results extend to the case where the buyer invests. We solve the game by backward induction and we start from the last stage of the game where prices are decided for given contractual decision and investment decision.

## 4.1 The incumbent invests

### 4.1.1 Last stage payoff: the effect of ED for given investment

When the ED has been agreed upon, the buyer can trade only with the incumbent. When the incumbent makes the offer (which occurs with probability 1/2), it charges the monopoly price $v_I + x$; when the buyer makes the offer it requires the good for free. Hence, under exclusivity $B$ and $I$ share evenly the value of trade $v_I + x$ . Firm $E$ does not sell in this case and its payoff is zero. The agents' payoffs (gross of investment costs) under exclusivity are indicated in the second column of Table 1 below.

When no ED has been signed, the agents' payoffs depend on which good exhibits higher valuation after the investment. Let us start from the case where *ex-post* $E$'s good is still valued more by the buyer (i.e. $v_E + \lambda x \geq v_I + x$). We will denote this case as the one where firm $E$ is ex-post more efficient. With probability 1/2 the buyer makes the offer, requires $E$'s good for free and appropriates entirely the value of trade $v_E + \lambda x$. With probability 1/2 suppliers compete for the buyer. The pricing game is a standard asymmetric Bertrand game. Firm $I$'s best offer is $p_I = 0$. At this price, $B$'s surplus is $v_I + x$. Therefore firm $E$ can win the buyer offering a price $p_E = v_E + \lambda x - (v_I + x)$ and appropriates the additional value that its good generates. Firm $I$'s does not sell and its payoff is zero. The argument is similar when it is $I$'s good that is valued more ex-post (i.e. when $v_I + x > v_E + \lambda x$). In this case, it is firm $E$ that does not sell and the incumbent appropriates the additional value generated by its good. The third column of Table 1 below reports the agents' payoffs absent exclusivity (gross of investment costs).

| | **ED** | **NoED** |
|---|---|---|
| $v_I + x > v_E + \lambda x$ | $\Pi_I = \frac{v_I+x}{2}$<br>$\Pi_B = \frac{v_I+x}{2}$<br>$\Pi_E = 0$ | $\Pi_I = \frac{v_I+x-(v_E+\lambda x)}{2}$<br>$\Pi_B = \frac{v_I+x}{2} + \frac{v_E+\lambda x}{2}$<br>$\Pi_E = 0$ |
| $v_I + x \leq v_E + \lambda x$ | $\Pi_I = \frac{v_I+x}{2}$<br>$\Pi_B = \frac{v_I+x}{2}$<br>$\Pi_E = 0$ | $\Pi_I = 0$<br>$\Pi_B = \frac{v_I+x}{2} + \frac{v_E+\lambda x}{2}$<br>$\Pi_E = \frac{v_E+\lambda x-(v_I+x)}{2}$ |

*Table 1: Agents' payoffs with and without exclusivity*

Table 1 highlights that, *for given investment*, signing an exclusive dealing contract benefits the incumbent and harms both the buyer and the entrant. Note, however, an important distinction. When the incumbent is ex-post more efficient (i.e. when $v_I + x > v_E + \lambda x$), ED redistributes welfare in favour of the incumbent but leaves total welfare unchanged. The buyer's loss is due to the fact that ED removes competition between the sellers, but trade none the less occurs with the more efficient supplier, namely the incumbent. Since firm $E$'s payoff is zero irrespective of exclusivity, in our model the incumbent's gain coincides with the buyer's loss:

$$\Delta\Pi_I(x) = \frac{v_E + \lambda x}{2} = -\Delta\Pi_B(x) \tag{1}$$

Instead, when the entrant is more efficient ex-post, by forcing trade with the incumbent ED *forecloses the more efficient supplier* and it not only redistributes total welfare but it also *reduces* it. In this case the loss caused to the buyer is larger than the incumbent's gain:

$$\Delta\Pi_I(x) = \frac{v_I + x}{2} < \frac{v_E + \lambda x}{2} = -\Delta\Pi_B(x) \tag{2}$$

#### 4.1.2 The effects of ED on investment incentives

At date 1, the incumbent chooses the level of investment in order to maximise its payoff net of investment costs:

$$\max_x \left[\Pi_I(x) - \gamma\frac{x^2}{2}\right] \tag{3}$$

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

**Lemma 1.** ***(Investment choice)***
*(i) Under exclusivity, the optimal level of the investment is* $x^{*ED} = 1/(2\gamma)$.
*(ii) Absent exclusivity, the incumbent invests if the investment cost is sufficiently low* ($\gamma < \overline{\gamma}$). *In this case the optimal level of the investment is* $x^{*NoED} = (1-\lambda)/(2\gamma)$. *Otherwise, the incumbent chooses not to invest* ($x^{*NoED} = 0$).
*The threshold level of the investment cost is* $\overline{\gamma} = (1-\lambda)^2/4(v_E - v_I)$.

*Proof.* See Appendix A.1. □

Note that, absent exclusivity, the incumbent chooses not to invest, if the investment cost is high enough ($\gamma \geq \overline{\gamma}$). Intuitively, if the investment is insufficient to make the incumbent more efficient ex-post ($x < (v_E - v_I)/(1-\lambda)$), investing entails costs but does not provide any benefit, as post-investment competition results in the incumbent making no sales (see Table 1). Also, since the investment cost is high, investing so much that the incumbent becomes ex-post more efficient is not profitable either.

It is now possible to evaluate the effect of ED on investment incentives:

**Lemma 2.** ***(Effect of ED on investment incentives)***
*When the ED is not renegotiable and the incumbent invests:*
*(i) if the external effect is positive ($\lambda > 0$), exclusive dealing always promotes investment: $x^{*ED} > x^{*NoED}$;*
*(ii) if the external effect is (weakly) negative ($\lambda \leq 0$), exclusive dealing promotes investment if (and only if) the investment cost is sufficiently large ($\gamma \geq \overline{\gamma}$); ED (weakly) hinders investment otherwise.*
*The threshold $\overline{\gamma}$ is the one characterised by Lemma 1.*

*Proof.* It follows immediately from Lemma 1. □

The idea is that, by prohibiting trade with firm $E$, ED removes suppliers' competition. When the investment cost is large enough, this always increases the marginal benefit of the investment and induces the incumbent to invest more relative to the case where there is no ED. When instead the investment cost is low, the effect of removing competition on the marginal benefit of the investment depends on the sign of the external effect.

To see why, let us start from the situation where the investment cost is large enough ($\gamma \geq \overline{\gamma}$). As Lemma 1 shows, absent ED the incumbent does not invest: investing so much as to become ex-post more efficient is too costly; investing less does not provide any benefit as the incumbent will not be able to compete successfully with firm $E$. Instead, under exclusivity trade must occur with the incumbent and generates value $v_I + x$. When it makes the offer - which occurs with probability 1/2 - the incumbent appropriates this value. For this reason, under exclusivity the incumbent benefits from additional investment even though the investment level is insufficient to make it ex-post more efficient, which makes the marginal benefit of the investment higher and investment incentives stronger (i.e. $\partial\Pi_I^{ED}(x)/\partial x = 1/2 > 0 = \partial\Pi_I^{NoED}(x)/\partial x$). Note that this effect of ED works irrespective of the sign of the external effect.

Instead, when the investment cost is sufficiently low ($\gamma < \overline{\gamma}$), absent ED investing so much as to become ex-post more efficient is profitable for the incumbent. In such a case, as a result of suppliers' competition, the incumbent obtains a payoff equal to its ex-post efficiency advantage ($v_I + x - v_E - \lambda x$), when it makes the offer. Hence, when the investment is decided, the incumbent takes into account that additional investment not only increases the value of its trade with the buyer ($v_I + x$) but also affects the value of trade between the buyer and the rival supplier ($v_E + \lambda x$). When $\lambda > 0$, the external effect is *detrimental to the incumbent*: by increasing the value of trade between $B$ and $E$, higher investment makes the rival supplier more efficient and decreases the incumbent's ex-post efficiency advantage. For this reason, absent exclusivity *investment incentives are weaker* relative to the case where the ED is in place, suppliers' competition is removed and the investment is driven *only by the internal effect* (i.e. $\partial\Pi_I^{NoED}(x)/\partial x = (1-\lambda)/2 < 1/2 = \partial\Pi_I^{ED}(x)/\partial x$). Instead, when $\lambda < 0$, the external effect is *beneficial to the incumbent*: by deteriorating the value of trade between $B$ and $E$, higher investment makes the rival supplier less efficient and increases the incumbent's ex-post efficiency advantage. For this reason, absent exclusivity *investment incentives are stronger* relative to the case where the ED is in place. (i.e. $\partial\Pi_I^{NoED}(x)/\partial x = (1-\lambda)/2 > 1/2 = \partial\Pi_I^{ED}(x)/\partial x$).

Note that when the investment cost is low ($\gamma < \overline{\gamma}$), it is precisely the existence of the external effect that makes ED relevant for investment incentives. If the investment has no external effect

(i.e. $\lambda = 0$), ED makes the incumbent earn a larger payoff but it does *not affect the investment benefits at the margin*, thereby leaving the equilibrium choice unchanged. Using the terminology of Segal and Whinston (2000b), who highlighted first this important insight, the "irrelevance result" holds.[17]

Instead, when the investment cost is sufficiently large ($\gamma \geq \overline{\gamma}$), the "irrelevance result" does not hold and ED increases the marginal benefit of the investment even when $\lambda = 0$. This different result is not due simply to the fact that the incumbent's payoff is null absent exclusivity and becomes positive when the ED is agreed upon. Rather, it is due to the fact that the positive payoff obtained under exclusivity is sensitive to investment. In turn this follows from our assumption that ED is not renegotiable so that the surplus shared ex-post is $v_I + x$. Hence, ED increases the incumbent's payoff by a term which responds to investment also when $\lambda = 0$. Instead, Segal and Whinston (2000b) assumes that (i) the initial contract is renegotiable so that when trade occurs, the parties are always able to appropriate the highest available surplus; (ii) the negotiation procedure is such that ED increases the incumbent's payoff by a term (the maximum surplus that the buyer and the entrant can generate) which does not depend on investment when the external effect is absent. For this reason, ED has no impact on investment incentives when the investment does not exert external effects.[18]

### 4.1.3 Contract decision and welfare effects

At date 1, the incumbent and the buyer decide on exclusivity. Lemma 3 shows that the ED contract is more likely to be signed when the external effect is positive and when the investment cost is sufficiently low. Proposition 1 shows that for intermediate values of the investment cost the signed contract, by leading to inefficient foreclosure, is welfare detrimental.

**Lemma 3.** ***(Contractual choice)***
*When the ED is not renegotiable and the incumbent invests, there exist a threhosld level of the investment cost, $\gamma^s \equiv 3/4(v_E - v_I)$, and a threshold level of the external effect, $\lambda^s \equiv 1 - \sqrt{3} < 0$, such that:*
*(i) if the external effect is positive ($\lambda > 0$), the ED is signed in equilibrium if (and only if) $\gamma < \gamma^s$;*
*(ii) if the external effect is (weakly) negative ($\lambda \leq 0$), the ED is signed in equilibrium if (and only if) $\lambda \in (\lambda^s, 0]$ and $\gamma \in [\overline{\gamma}, \gamma^s)$.*

*Proof.* See Appendix A.1. □

To see the intuition let us consider first the case where the *external effect is positive*. Imagine there is no exclusive dealing contract and consider the investment $x^{*NoED}$ chosen by the incumbent in this case. By Table 1 we know that introducing exclusivity - keeping the investment *fixed* at $x^{*NoED}$ - benefits the incumbent but harms the buyer, and that the buyer's loss is (weakly) larger

[17] The importance of marginal benefits over absolute profit levels for investment incentives has been highlighted also in recent papers on a variety of topics, ranging from the effect of buyer power on investment incentives (Inderst and Wey 2007), the effect of regulation in the pharmaceutical industry on R&D efforts (Ganuza, Llobet and Dominguez 2008), to the effect of market design on investment incentives (DeFrutos, Fabra and Van der Fehr, 2008).

[18] A number of negotiation procedures typically used in the literature exhibit this properties, but there are also equally reasonable procedures that do not (see DeMeza and Selvaggi, 2007 and discussion is Section 5.1.2).

than the incumbent's gain: $\Delta\pi_I(x^{*NoED}) \leq -\Delta\pi_B(x^{*NoED})$.[19] Note that the previous inequality is strict when $x^{*ED} = 0$ (i.e. when $\gamma \geq \overline{\gamma}$) because firm $E$ is more efficient and the introduction of ED forecloses its activity. It follows that, *absent any effect of ED on investment*, the Chicago School Critique applies: the exclusive dealing contract would not be signed in equilibrium because the lowest compensation that the buyer requires to sign is (weakly) larger than the incumbent's gain from having the contract signed; then the incumbent could never elicit the buyer's acceptance is a *profitable* way.

However, by Lemma 2 when the external effect is positive, ED also stimulates the investment ($x^{*ED} > x^{*NoED}$). This increases both the incumbent and the buyer's payoff under exclusivity (the former, by revealed preferences; the latter because higher investment increases the value of internal trade and the buyer appropriates part of this value), thereby *mitigating the buyer's loss* due to exclusivity and *expanding the incumbent's gain.* The lower the investment cost, the higher the investment increase spurred by ED, the more likely that the incumbent's gain becomes large enough to profitably compensate the buyer. Hence, if the investment cost is low enough ($\gamma < \gamma^s$ with $\gamma^s > \overline{\gamma}$), $I$ and $B$ jointly gain from the introduction of ED and have a private incentive to agree on it.

ED can promote investment also when the *external effect is negative*, as long as the investment cost is large enough (i.e. $\gamma \geq \overline{\gamma}$ as Lemma 2 shows). In such a case, the same logic illustrated above applies and the ED is signed if $\gamma < \gamma^s$.[20]

Instead, if the investment cost is sufficiently low, ED *limits* the investment. This makes the buyer's loss due to the introduction of exclusivity always larger than the incumbent's gain and explains why $B$ and $I$ dot not have the incentive to enter into an exclusive dealing contract.[21] Figure 2 summarizes the contractual choice for the feasible values of the external effect and of the investment cost.

Let us now analyse the welfare effects of ED. Note that, when deciding on exclusivity, $I$ and $B$ do not internalize the effect of their decision on firm $E$ and thus on total welfare. Indeed, the introduction of exclusivity *harms* firm $E$ when, absent ED, it is firm $E$ that supplies the buyer - i.e. when $\gamma \geq \overline{\gamma}$ so that the incumbent does not invest absent exclusivity and firm $E$ is more efficient. The higher the investment cost, the weaker investment promotion due to ED, the smaller the increase in $B$ and $I$'s joint payoff, the less likely that this increase dominates firm $E$'s loss. It turns out that, when the investment cost is intermediate, investment promotion is strong enough

[19] We denote with $\Pi$ payoffs gross of investment costs and with $\pi$ net payoffs. Since we keep investment fixed, the variation of the two due to the introduction of exclusivity is the same.

[20] There is, however, a difference with the case where the external effect is positive. When the external effect is negative, there is scope for signing ED only as long as the two conditions $\gamma \geq \overline{\gamma}$ and $\gamma < \gamma^s$ are simultaneously satisfied. This is the case if (and only if) $\lambda > \lambda^s$. The reason is that $\overline{\gamma}$ represents the level of investment costs such that, absent exclusivity, the optimal investment that makes $I$ more efficient ex-post yields zero profits. The stronger the negative external effect, the lower the investment required to become more efficient ex-post. Hence, when $\lambda < \lambda^s$, $\overline{\gamma}$ is so high that it is always larger than $\gamma^s$ and there is no scope for signing the ED.

[21] It is important to point out that our assumption that $\lambda \geq -1$ plays a role for this result. As Appendix A.1 will explain more extensively, if $\lambda < -1$ (i.e. if the external effect is stronger than the internal one) the higher investment induced when exclusivity is absent harms the buyer. If this effect is strong enough, $B$ and $I$ would have an incentive to enter into an exclusive dealing contract because it *stifles* (rather than stimulates) the investment. An analogous argument applies if we maintain the restriction $\lambda \geq -1$ and we allow for $b < 1/2$. Note however that in these cases ED would be welfare beneficial.

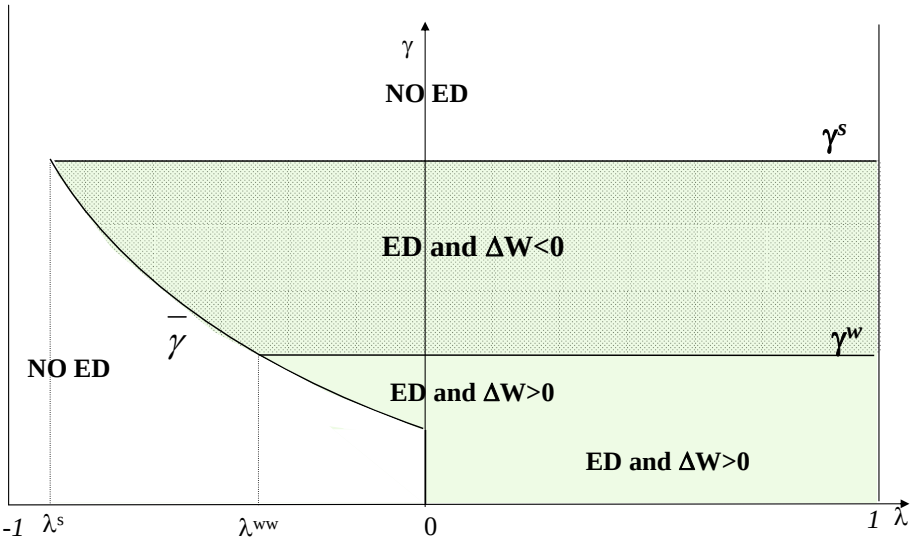


Figure 2: Contractual choice and welfare effects under no renegotiation (the incumbent invests)

to generate $B$ and $I's$ *private* incentive to agree on exclusivity, but it is *insufficient* to make ED welfare beneficial.[22]

Instead, the introduction of ED does not affect firm $E's$ payoff when it does not supply the buyer even absent exclusivity - i.e. when $\gamma < \overline{\gamma}$ so that the incumbent invests even absent ED ($x^{*NoED} > 0$) and the investment makes $I$ more efficient. In this case ED is socially optimal whenever it is privately so. It follows that when the external effect is positive, the ED is signed and it is welfare beneficial. When the external effect is negative, it is both privately and socially optimal not to sign the exclusive dealing contract.

These results are stated by the following Proposition:

**Proposition 1.** ***(Welfare effects of ED)***
*When the ED is not renegotiable and the incumbent invests, there exists a threshold level of the investment cost $\gamma^w \equiv 3/8(v_E - v_I)$ with $\gamma^w < \gamma^s$ such that:*
*(i) if the external effect is positive ($\lambda > 0$), the ED is signed and is welfare detrimental if (and only if) $\gamma \in (\gamma^w, \gamma^s)$;*
*(ii) if the external effect is (weakly) negative ($\lambda \leq 0$) the ED is signed and is welfare detrimental if (and only if) $\lambda \in (\lambda^s, 0]$ and $\gamma \in [\max\{\gamma^w, \overline{\gamma}\}, \gamma^s)$.*
*The thresholds $\gamma^s$ and $\lambda^s$ are the ones identified by Lemma 3.*

*Proof.* See Appendix A.1. □

An alternative way to see why ED is welfare detrimental is the following. Absent exclusivity, total welfare amounts to $v_E$ because the incumbent does not invest and trade occurs with firm $E$, which is the more efficient supplier. The introduction of ED, by forcing trade with the incumbent,

[22]When $\gamma \geq \overline{\gamma}$, this argument applies irrespective of the sign of the external effect. However, as explained in footnote 20, when the external effect is negative an additional restriction ($\lambda > \lambda^s$) is required to make the ED be signed in equilibrium (such restriction ensures that $\gamma < \gamma^s$ and $\gamma \geq \overline{\gamma}$ are compatible). Also, when $\lambda$ is small enough (more precisely, when $\lambda \leq \lambda^{ww}$, with the threshold $\lambda^{ww}$ identified in the proof of Proposition 1; see also Figure 2), the ED is welfare detrimental whenever it is signed (because $\gamma^w \leq \overline{\gamma}$ when $\lambda \leq \lambda^{ww}$).

promotes investment and increases the value of such trade - which becomes $v_I + x^{*ED}$. When the investment cost takes intermediate values this effect is sufficiently strong to make $B$ and $I$ willing to sign the contract; however, investment promotion is too weak to be beneficial for society because (i) either the incumbent remains less efficient than firm $E$ ($v_I + x^{*ED} < v_E$); (ii) or the incumbent becomes more efficient than firm $E$, but achieving such an improvement is too costly for society. In both cases, ED welfare detrimental because $B$ and $I$ have a socially excessive incentive to use it.

The Proposition formally states the result that we have already highlighted in the example of Section 3: an exclusive dealing contract which forecloses a more efficient supplier may be signed *precisely* because it promotes investment. To see this, imagine that investment is not possible - which in our setting corresponds to the case where the investment cost is prohibitively high. As can be seen in Figure 2, when $\gamma \to \infty$ the ED is not signed in equilibrium. The reason is that absent investment promotion there is no positive effect that can outweigh inefficient foreclosure (remember that $v_E > v_I$) so that the incumbent's gain from the introduction of ED is necessarily lower than the buyers' loss. Hence, foreclosure is not a concern in this case. Instead, when investment is possible and $\gamma$ takes intermediate values, the ED is signed (precisely because investment promotion induces $B$ and $I$ to agree on it), but is welfare detrimental (because it leads to inefficient foreclosure or wasteful investment by I).

## 4.2 The buyer invests

We now turn to the case of the buyer investing in the relationship with the incumbent. The analysis follows the same steps as for the incumbent investing, so we keep it brief. The flavour of the results will also be quite similar: the exclusive dealing contract is signed in equilibrium when the investment cost is sufficiently low. For intermediate values of the investment cost, the signed contract is welfare detrimental because it leads to inefficient foreclosure. There is, however, a major difference: when the buyer invests the ED is signed only if the external effect is negative.

### 4.2.1 The effect of ED on investment incentives

At date 1 the buyer chooses the level of investment that maximizes its payoff net of investment costs:

$$\max_x \left[\Pi_B(x) - \frac{\gamma}{2}x^2\right]. \tag{4}$$

where $\Pi_B(x)$ is given by Table 1. The following lemma characterizes the effect of ED on investment incentives.

**Lemma 4.** ***(Effect of ED on investment incentives)***
*When the ED is not renegotiable and the buyer invests, then ED promotes the investment if (and only if) the external effect is negative* $(\lambda < 0)$.

*Proof.* By solving the problem 4, it follows immediately that the under exclusivity, the buyer's optimal level of the investment is $x^{*ED} = 1/(2\gamma)$; absent exclusivity, the buyer's optimal level of the investment is $x^{No*ED} = (1+\lambda)/(2\gamma)$. The comparison between the two leads to the result stated in the Lemma. □

The intuition is again that, under exclusivity, investment incentives are *entirely* determined by the *internal effect:* when deciding the investment level the buyer anticipates that trade will necessarily occur with the incumbent and that, when it makes the offer, it will fully benefit from the increase of the value of such trade due to additional investment. Instead, absent exclusivity, investment incentives are driven by *both* the internal effect *and the external effect.* The reason is that, when it makes the offer, the buyer extracts the entire value of trade with the more efficient supplier; when suppliers make the offer, Bertrand competition allows the buyer to obtain the value of trade with the less efficient supplier. Unless the external effect is zero, additional investment affects both values of trade and the buyer internalizes both effects. However, when $\lambda < 0$, the external effect of the investment is detrimental to the buyer, because it deteriorates the value of external trade. Then, internalising also this effect when exclusivity is absent makes investment incentives weaker. The opposite occurs when the $\lambda > 0$ and the external effect is beneficial to the buyer.[23]

Note that, absent exclusivity, the external effect of the investment affects the buyer and the incumbent in opposite directions (provided that the investment is large enough to make the incumbent ex-post more efficient): the buyer is harmed by the external effect precisely when the incumbent benefits from it (and vice-versa). This suggests why, when when investment costs are sufficiently low, the effects of ED on investment incentives are opposite in the two cases. Finally, absent exclusivity, the buyer's benefit from investment is independent of the identity of the most efficient supplier. The effect of ED on investment incentives does therefore not depend on the cost of investment $\gamma$, which determines the productivity difference between the suppliers.

#### 4.2.2 Contract decision and welfare effects

Once the differences in the effect of ED on investment incentives are taken into account, the contractual choice and its welfare effects can be easily understood from the previous analysis of the incumbent investing.

When the external effect is negative and thus ED stimulates the investment, $B$ and $I$ enter into an exclusivity agreement for sufficiently low investment cost $\gamma$ ($\gamma \leq \widetilde{\gamma}^s$). In such a case, ED increases investment by a substantial amount, which makes the incumbent's gain from exclusivity larger than the the buyer's loss. The signed contract is welfare detrimental for intermediate investment cost ($\gamma \in (\widetilde{\gamma}^w, \widetilde{\gamma}^s)$) because the additional investment spurred by ED is not large enough to make the gain of the buyer-incumbent coalition dominate the welfare loss due to inefficient foreclosure.

When the external effect is positive, ED is never an equilibrium outcome. This result is due to the fact that ED hinders investment, which makes the buyer's loss due to the introduction of exclusivity always larger than the incumbent's gain.

*Proof.* See Appendix A.2. □

These results are illustrated by the following Proposition and by Figure 3.

[23] For a generic $b$ and high enough investment costs, ED stimulates the investment for $\lambda$ low enough. The assumption $b = 1/2$ implies that such a threshold level of $\lambda$ is exactly zero. When $b > 1/2$, the threshold is positive, and ED may stimulate the investment also when the external effect is positive. Viceversa, when $b < 1/2$ : ED can limit the investment also when the external effect is negative. However, qualitatively our results would remain unchanged.

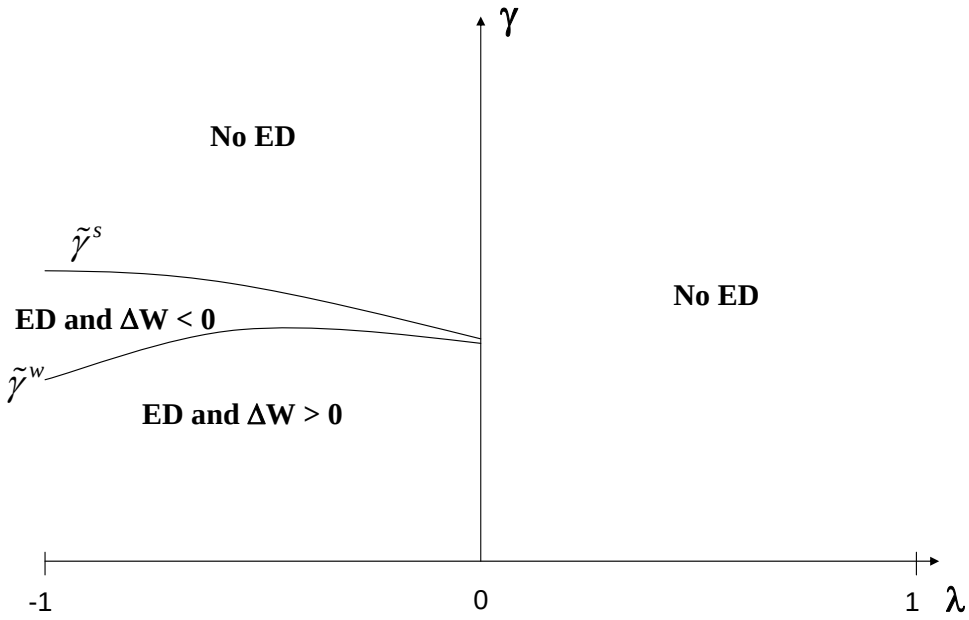


Figure 3: Contractual choice and welfare effects under no renegotiation (the buyer invests)

**Proposition 2.** ***(Contractual choice and welfare effects)***
*When the ED is not renegotiable and the buyer invests, there exist two theshold levels of the investment costs,* $\widetilde{\gamma}^s \equiv \frac{2-2\lambda-\lambda^2}{4(v_E-v_I)}$ *and* $\widetilde{\gamma}^w \equiv \frac{4-2\lambda-3\lambda^2}{8(v_E-v_I)}$ *with* $\widetilde{\gamma}^s \geq \widetilde{\gamma}^w$*, such that:*
*(i) the ED is signed in equilibrium if (and only if) the external effect is negative* ($\lambda \leq 0$) *and the investment cost is* $\gamma < \widetilde{\gamma}^s$*.*
*(ii) the signed contract is welfare detrimental if (and only if) the external effect is negative* ($\lambda < 0$) *and the investment cost is* $\gamma \in (\widetilde{\gamma}^w, \widetilde{\gamma}^s)$*.*

*Proof.* See Appendix A.2. □

# 5 When evaluating the effects in isolation is misleading

In this Section we assume that after the investment has been done, but before trade takes place, the exclusive dealing contract can be renegotiated: the buyer and the incumbent negotiate over the penalty that $B$ must pay to $I$ in order to remove exclusivity and be free to buy from any supplier. We start the analysis with the case where the incumbent invests (Section 5.1), which is the one that delivers the more interesting insights, followed by the case where the buyer is the investing agent (Section 5.2).

By comparing the results obtained in the case of no renegotiation (Section 4) with the ones that we shall obtain in this Section, we will be able to highlight the importance of taking into account the interaction between investment promotion and potential foreclosure.

## 5.1 The incumbent invests

In this Section we assume that the renegotiation procedure is such that the incumbent has no bargaining power and is left with its disagreement payoff. Differently stated, the penalty paid by

the buyer in case of breach of exclusivity amounts to the profits that the incumbent would have obtained if renegotiation had not taken place and the contract had been complied. The reason why we focus on this special case is that it leaves investment incentives unchanged relative to the case where ED is not renegotiable.[24,25]

### 5.1.1 Last stage payoff: the effect of ED for given investment

Given the contractual and the investment decision, the agents' payoffs at the last stage of the game are reported by Table 2.

| | **ED** | **NoED** |
|---|---|---|
| $v_I + x > v_E + \lambda x$ | $\Pi_I = \frac{v_I+x}{2}$<br>$\Pi_B = \frac{v_I+x}{2}$<br>$\Pi_E = 0$ | $\Pi_I = \frac{v_I+x-(v_E+\lambda x)}{2}$<br>$\Pi_B = \frac{v_I+x}{2} + \frac{v_E+\lambda x}{2}$<br>$\Pi_E = 0$ |
| $v_I + x \leq v_E + \lambda x$ | $\Pi_I = \frac{v_I+x}{2}$<br>$\Pi_B = \frac{v_E+\lambda x}{2}$<br>$\Pi_E = \frac{v_E+\lambda x-(v_I+x)}{2}$ | $\Pi_I = 0$<br>$\Pi_B = \frac{v_I+x}{2} + \frac{v_E+\lambda x}{2}$<br>$\Pi_E = \frac{v_E+\lambda x-(v_I+x)}{2}$ |

*Table 2: Agents' payoffs when ED is renegotiable.*

Note that the unique case where renegotiation makes a difference is the one where the ED has been signed and firm $E$ is ex-post more efficient (if it is the incumbent that is more efficient ex-post, $B$ and $I$ have no incentive to renegotiate the initial contract). In such a case, the penalty for breach (as well as the incumbent's payoff) amounts to $(v_I + x)/2$, which is the profit that the incumbent would have made had the contract been complied with. By paying this penalty, the buyer removes any exclusivity obligation and the terms of trade are established as in the absence of ED. It follows that the buyer chooses to be supplied by the more efficient firm $E$, extracting entirely the value of trade $v_E + \lambda x$ when it makes the offer, and obtaining the value of the incumbent's good when suppliers make the offer and (asymmetric) Bertrand competition takes place. Net of the penalty the buyer's payoff is $(v_E + \lambda x)/2$. Note also that firm $E$ supplies the buyer and obtains a positive payoff even if the ED is in place, namely it appropriates the additional value that its good generates (when suppliers make the offer).

Hence, differently from the case where the initial contract is not renegotiable, now ED *does not lead to the foreclosure* of the more efficient supplier. This has two implications on the effect of ED *for given investment*. First, the introduction of exclusivity redistributes welfare in favour of the incumbent *without* affecting total welfare also when firm $E$ is ex-post more efficient. Second, the buyer's loss is reduced as compared to the case of no renegotiation and, in our specific model, it always coincides with the incumbent's gain:

$$\Delta\Pi_I(x) = \frac{v_I + x}{2} = -\Delta\Pi_B(x) \tag{5}$$

[24] Section 6 discusses the case where the incumbent has some power is determining the penalty for breach.

[25] An additional reason is that this case is equivalent to the imposition of *expectation damages,* which are the damages commonly enforced at least in Civil Law countries (see Macaulay et al. 1995, Hatziz 2001 and Cooter and Ulen 2004).

### 5.1.2 The effects of ED on investment incentives

Since our renegotiation procedure leaves the incumbent with its disagreement payoff, firm $I$'s investment choice as well as the effect of ED on investment incentives are the same as in the case of no renegotiation. Hence, Lemma 1 still applies and ED always stimulates the investment when the external effect is positive; when the external effect is negative, ED stimulates the investment only if the investment cost is large enough (i.e. $\gamma \geq \overline{\gamma}$).[26]

### 5.1.3 Contract decision and welfare effects

We now analyze the date 1 decision on whether to sign the exclusive dealing contract and the associated welfare effects. Figure 4 illustrates the results for the feasible values of the investment cost and of the external effect. A comparison with Figure 2 makes it apparent that the possibility to renegotiate the initial contract makes *more likely* that ED is an equilibrium outcome and that it is welfare beneficial.

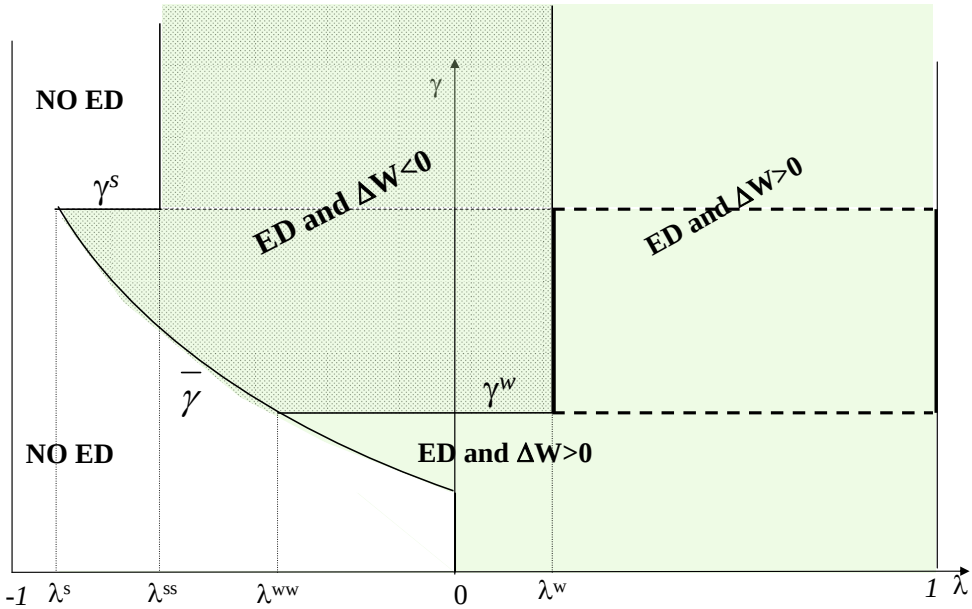


Figure 4: Contractual choice and welfare effects under renegotiation (the incumbent invests)

The intuition is simple. The possibility to renegotiate the initial contract removes foreclosure, i.e. when firm $E$ is ex-post more efficient than the incumbent, trade with the former is possible even though the ED is in place, which allows society to benefit from the additional surplus created by the more efficient supplier. This has two implications. First, $B$ and $I$ are willing to renegotiate the initial contract if they obtain *at least* their disagreement payoff, i.e. the payoff they are entitled to if the contract is complied with. It follows that after renegotiation the buyer and the incumbent's payoffs under exclusivity cannot but (weakly) increase relative to the case of no renegotiation.

[26] Note that when the investment cost is large enough ($\gamma \geq \overline{\gamma}$), in our setting it is still the case that the "irrelevance result" does not hold and ED increases the marginal benefit of the investment even when no external effect is exerted ($\lambda = 0$). This different result as compared to Segal and Whinston (2000b) is due to the fact that their (re)negotiation procedure is such that the introduction of ED increases the incumbent's payoff by a term which is insensitive to investment when the external effect is absent, while our renegotiation procedure does not share this property.

Then, the buyer's loss due to the introduction of exclusivity cannot but (weakly) decrease and the incumbent's gain cannot but (weakly) increase relative to that case. This suggests why it becomes more likely that the ED is signed in equilibrium. Second, total welfare under exclusivity cannot but (weakly) increase relative to the case of no renegotiation, which suggests why it becomes more likely that ED is welfare beneficial.

More precisely, in our model we have assumed a specific renegotiation procedure such that, for given investment, introducing exclusivity causes the buyer a loss which coincides with the incumbent's gain. This implies that, when the external effect is positive, $B$ and $I$ have always an incentive to agree on exclusivity. ED stimulates the investment. Investment promotion increases both the incumbent and the buyer's payoff under exclusivity: the former by revealed preferences; the latter because $\pi_B = \max\{(v_E + \lambda x)/2; (v_I + x)/2\}$ and higher investment, either through the external or the internal effect, increases the value of trade and thus benefits the buyer. Then, the buyer's loss due to exclusivity is mitigated and the incumbent's gain is expanded, making the latter always dominant.

ED promotes the investment also when the external effect is negative, provided that the investment cost is large enough ($\gamma \geq \overline{\gamma}$). In this case, while investment promotion increases the incumbent's payoff under exclusivity, it decreases the buyer's one by deteriorating the value of external trade ($\pi_B = (v_E + \lambda x)/2$). Hence, the higher investment stimulated by ED expands the incumbent's gain from exclusivity, *but it also expands* the buyer's loss. Then, $B$ and $I$ have a private incentive to sign the ED when the negative external effect is not too strong.

Finally, when the external effect is negative and the investment cost is sufficiently low ($\gamma < \overline{\gamma}$), ED *limits* the investment. This makes the buyer's loss due to the introduction of exclusivity always larger than the incumbent's gain and explains why $B$ and $I$ dot not have the incentive to enter into an exclusive dealing contract.

The introduction of exclusivity may harm firm $E$ also when the initial contract is renegotiable. When this loss dominates the benefit of the buyer-incumbent coalition, the introduction of ED is welfare detrimental. More precisely, when the investment cost is sufficiently large (i.e. when $\gamma \geq \overline{\gamma}$), absent exclusivity the incumbent does not invest. Hence, firm $E$ is more efficient, it supplies the buyer and appropriates its efficiency advantage: $\pi_E = (v_E - v_I)/2$. Under exclusivity, investment is promoted. This may make the incumbent ex-post more efficient, so that $B$ and $I$ have no incentive to renegotiate, 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 instead the incumbent remains less efficient than the entrant, renegotiation occurs. The entrant makes positive profits also when ED is in place - $\pi_E = (v_E + \lambda x^{*ED} - v_I - x^{*ED})/2$ - but the investment reduces its efficiency advantage and thus its payoff. In this latter case ED, by fostering investment, allows the buyer-incumbent coalition to extract more rents from the more efficient producer. The weaker the external effect the larger the loss suffered by firm $E$; also, the higher investment cost, the weaker investment promotion due to ED, the smaller the increase in $B$ and $I$'s joint payoff. Hence, when the external effect is sufficiently weak and the investment cost is sufficiently high, firm $E$'s loss dominates and ED is welfare detrimental.

These results are stated by the following Proposition:

**Proposition 3.** ***(Contractual choice and welfare effects)***
*When the initial contract is renegotiable and the incumbent invests, there exists two threshold levels*

*of the external effect,* $\lambda^{ss} \equiv -1/2 > \lambda^s$ *and* $\lambda^w \equiv 1/4$ *such that:*
*(i) if the external effect is positive* ($\lambda > 0$)*, the ED is always signed in equilibrium; the signed contract is welfare detrimental iff* $\lambda \in (0, \lambda^w)$ *and* $\gamma \geq \gamma^w$.
*(ii) if the external effect is (weakly) negative* ($\lambda \leq 0$)*, the ED is signed in equilibrium if (and only if)* $\lambda \in (\lambda^s, \lambda^{ss})$ *and* $\gamma \in [\overline{\gamma}, \gamma^s)$ *- in this case the signed contract is always welfare detrimental; or* $\lambda \in [\lambda^{ss}, 0]$ *and* $\gamma \geq \overline{\gamma}$ *- in this case the signed contract is welfare detrimental for any* $\gamma > \max\{\overline{\gamma}, \gamma^w\}$.
*The thresholds* $\overline{\gamma}, \gamma^s$, $\lambda^s$ *and* $\gamma^w$ *are the ones identified by the previous Lemma and Propositions.*

*Proof.* See Appendix B.1. □

The comparison between Figure 4 and Figure 2 allows to identify some parameter configurations ($\gamma \in (\gamma^w, \gamma^s)$ and $\lambda > \lambda^w$, i.e. the area with thick borders in Figure 4) such that ED is welfare detrimental when the initial contract is not renegotiable, but it turns out to be welfare beneficial when renegotiation is feasible. To see the intuition consider that in this region, absent ED, no investment takes place and trade occurs with the more efficient firm $E$ which generates value $v_E$. Under ED, investment is promoted ($x^{*ED} > 0$). When the initial contract is not renegotiable trade must occur with the incumbent. This implies that society can take advantage of investment promotion only through the internal effect which, as shown by Proposition 1, is insufficient in this region: either $v_I + x^{*ED} \leq v_E$ so that investment promotion is clearly inefficient; or $v_I + x^{*ED} > v_E$, so that investment promotion makes the incumbent more efficient than firm $E$ absent the ED, but such an improvement is too costly for society. Why does investment promotion become beneficial when the initial contract is renegotiable? The reason is that investment promotion can benefit society also through the external effect: trade with firm $E$ can take place even though the ED is in place; on top of this, through the external effect, the investment spurred by ED increases the value of such trade, which becomes $v_E + \lambda x^{*ED} > v_I + x^{*ED}$. If the external effect is positive and sufficiently strong, investment promotion becomes worthy for society.

This comparison reiterates the point made in the example of Section 3 that evaluating separately the risk of foreclosure and potential investment promotion of ED, *disregarding their interaction*, does not provide a correct measure of the impact of ED on welfare. More precisely, imagine that renegotiation is not possible and let investment costs be infinite ($\gamma \to \infty$) so that ED cannot stimulate investment. This amounts to focusing only on the potential foreclosing effect of ED. As Section 4.1.3 has shown, in our model ED would not arise in equilibrium and the risk of foreclosure would be absent. Imagine now that renegotiation is possible, so that ED cannot foreclose efficient entry, and let the investment cost take a finite value, so that ED can stimulate investment. This amounts to focusing only on the potential pro-competitive effect of ED. In our model, when the spillover is positive and strong enough ($\lambda > \lambda^w$) , and the investment cost is intermediate ($\gamma \in (\gamma^w, \gamma^s)$) ED is signed and is welfare beneficial. Hence, if considering the two potential effects in isolation and then summing them up, one would conclude that the risk of foreclosure is absent while the investment-fostering effect is beneficial, so that overall effect of ED on total welfare is positive. Instead, by allowing for foreclosure and investment promotion to operate *simultaneously* (i.e. by letting the investment cost to be finite but ruling out renegotiation) one would obtain a different conclusion: for the same parameters' values, ED would be signed and would be welfare detrimental.

Note also that, when the external effect is negative, the situation where renegotiation makes the welfare effect of ED turn from negative to positive never arises. Intuitively recall that, when the external effect is negative, for the parameter configurations such that ED is signed in equilibrium, no investment takes place absent ED, so that trade occurs with the more efficient firm $E$ and it generates value $v_E$. Under ED, investment is promoted ($x^{*ED} > 0$). Recall also that renegotiation of the initial contract makes a difference only when investment promotion is insufficient to make the incumbent ex-post more efficient (i.e. when $v_I + x^{*ED} \leq v_E + \lambda x^{*ED}$). In such a case renegotiation allows to trade with the more efficient firm $E$, thereby mitigating the detrimental effect of ED. However, precisely the fact that the investment deteriorates the value of trade with firm $E$ makes it impossible that under ED society achieves a higher welfare level as compared to the situation where no contract is in place and no investment is done (i.e. $v_E + \lambda x^{*ED} - \gamma(x^{*ED})^2/2 < v_E$). This implies that when the external effect is negative, evaluating the risk of foreclosure and investment promotion in isolation cannot lead to misleading conclusions.

### 5.2 The buyer invests

Suppose now that it is the buyer that invests. We also assume that the renegotiation procedure is such that the buyer has no bargaining power and is left with its disagreement payoff. As before, under this assumption the investment incentives are the same as in the case of no renegotiation, which allows us to identify the effects of foreclosure in a clearer way.

The possibility to renegotiate an ED contract only plays a role if the value of internal trade is lower than the value of external trade, $v_I + x < v_E + \lambda x$. Table 3 reports the agents' payoffs at the last stage of the game in this case:

| | **ED** | **NoED** |
|---|---|---|
| $v_I + x < v_E + \lambda x$ | $\Pi_I = \frac{v_E+\lambda x}{2}$<br>$\Pi_B = \frac{v_I+x}{2}$<br>$\Pi_E = \frac{v_E+\lambda x-(v_I+x)}{2}$ | $\Pi_I = 0$<br>$\Pi_B = \frac{v_I+x}{2} + \frac{v_E+\lambda x}{2}$<br>$\Pi_E = \frac{v_E+\lambda x-(v_I+x)}{2}$ |

*Table 3: Agents' payoffs when ED is renegotiable.*

Lemma 4 shows that ED stimulates investment only if the external effect is negative. Applying the argument in the proof of Lemma 2, it follows that ED arises in equilibrium only if the external effect is negative. This implies that there do not exist circumstances where renegotiation turns ED from being welfare reducing to welfare enhancing. The reason is that when renegotiation matters for the outcome ($v_I + x < v_E + \lambda x$), the additional investment due to ED reduces the buyer's value of trading with the more efficient entrant.

## 6 Extensions

In this Section we relax some of the assumptions made in the model, and we discuss the possible application of our analysis to other contexts.

**Single buyer vs. multiple buyers** The model of Section 2 assumes that there exists a single buyer. Under the assumption of multiple buyers, our main result that investment promotion may facilitate foreclosure - thereby worsening rather mitigating the concerns on the detrimental effect

of ED - is still valid, as long as the incumbent is *unable to elicit acceptance on exclusivity absent the investment.*

The recent literature on the 'foreclosing effect' of ED has identified a number of situations where this is the case:[27] (i) when buyers are fierce downstream competitors; (ii) when downstream competition is sufficiently weak but buyer power is strong or there are weak economies of scale from the supply side; (iii) when the incumbent cannot discriminate contractual offers and fragmented buyers do not suffer from coordination failures; (iv) when the incumbent can discriminate contractual offers but it is not profitable for it to fully compensate the critical number of buyers such that entry is discouraged. Note that in this latter case the scope for investment promotion to cause inefficient foreclosure is wider than in our model. Indeed, to make the ED signed and inefficient foreclosure arise, it is *not* necessary that investment promotion is so strong to make it profitable for the incumbent to compensate *all* the buyers, i.e to make the incumbent's total gain from exclusivity become larger than the loss suffered by all the buyers. It is sufficient that investment promotion makes it profitable to compensate *only* the critical number of buyers such that entry is discouraged.

Our result does not hold when, instead, the ED is signed even absent the investment. In such a case inefficient foreclosure would occur anyway, and investment promotion would mitigate (possibly remove) the welfare detrimental effect of ED.

**Alternative renegotiation procedures** Section 5 has analyzed the case where the exclusive contract can be renegotiated, assuming a specific procedure that leaves the investing agent with its disagreement payoff.

If we assumed that the renegotiation procedure gives the investing agent a share of the additional surplus generated by the more efficient entrant, on top of the disagreement payoff, we should also take into account that the investment undertaken when the ED is renegotiable is *lower* than the one made when the ED is not renegotiable. The intuition is that under renegotiation the investing agent internalizes *also* the fact that higher investment *decreases the entrant's efficiency advantage.*[28] In other words, even though under renegotiation the absolute payoff of the investing agent is larger, it is less sensitive to investment and investment incentives are weaker as compared with the situation where the ED cannot be renegotiated. Then, under feasible renegotiation it would be less likely that ED stimulates investment. None the less, the conclusions obtained in Section 5 would remain qualitatively the same.

**Antitakeover provisions** These results can be applied to contexts different from the debate on ED, for instance to the corporate governance debate on the effects of antitakeover provisions (ATPs). These are agreements that make it more difficult to replace the incumbent executives with new ones after a takeover (which makes them similar to ED), thereby discouraging takeover attempts.[29] Such provisions include shareholder rights plans, staggered elections of Board of Directors and golden parachutes (i.e. agreements between the firm and top executives specifying that the latter will receive certain significant benefits if employment is terminated).

[27] See Rasmusen, Ramseyer and Wiley (1991), Segal and Whinston (2000a), Fumagalli and Motta (2006).

[28] Note that this holds irrespective of whether the external effect is positive or negative.

[29] The seminal works of this copious literature are Lipton (1979) and Easterbrook and Fishel (1981). The debate is summarised at lenght in Romano (1992), Bebchuck (2003) and Hannes (2006).

The opponents of ATPs argue that they represent an obstacle to the correct functioning of the market for corporate control because they discourage efficient takeovers, i.e. takeovers that replace the incumbent management with a more efficient one. The proponents of ATPs argue instead that they can exert beneficial effects that outweigh the above costs. In particular ATPs, by making managers takeover-proof, can encourage them to undertake firm-specific non-contractible investments or long-term investments whose returns are likely to be underestimated by (inefficient) markets.[30]

Our paper contributes to this debate suggesting that the fact that ATPs foster investment does not necessarily make their welfare detrimental effects less likely. Indeed, shareholders' approval of ATPs in the firm charter might be a proof that they are optimal from the firm's perspective, while being detrimental to society since they discourage efficient takeovers.

**Covenants not to compete** Our paper might also have a bearing on the literature on covenants not to compete (CNCs) in labour contracts. Legal scholars have argued that the weak enforcement of CNCs in California is key the economic success of Silicon Valley, because knowledge sharing through labor mobility is facilitated (Gilson, 1999; Hyde, 2001). Still, other authors claim that covenants not to compete protect firms' intellectual property and enhance welfare by stimulating investment in the employer-employee relationship (Rubin and Shedd, 1981; Glick et al., 2002). Our paper warns that covenants not to compete might be welfare detrimentral precisely because of investment promotion.

# 7 Policy implications

It is probably fair to say that there is consensus among economists that exclusive dealing should be treated under a rule of reason. First, the plaintiff should make out a prima facie case of anti-competitive effects. At this stage, the plaintiff should also provide a theory of harm identifying the exclusionary motives behind the concerned practice. Second, it would be upon the defendant to prove that exclusive dealing serves efficiency goals (such as protection of investments) in the case at hand. Finally, if both anti-competitive and efficiency effects are proved, an evaluation of the magnitude of these effects, and a balancing of the two, should be made. Exclusive dealing would be unlawful if the likely net effect is adverse.

Our analysis might affect the policy towards exclusive dealing in two respects. First, our paper identifies a new situation where exclusive dealing might lead to exclusion of efficient rivals, thus expanding the set of situations where a possible theory of harm exists. In particular, we show that even absent fragmentation of buyers, scale economies and other well-known reasons possibly leading to exclusion, exclusive dealing, by fostering investments, might make it easier for an exclusive dealing contract deterring efficient entry to be signed.

Second, our analysis suggests that the balancing exercise of any anti- and pro-competitive effects might be even more complex than already aknowledged, since we show that the very existence of investment-promotion effects - rather than being only welfare beneficial - might actually make it easier for exclusive dealing to foreclose efficient entry.

[30] On the former, se Stout and Blair (1999). On the latter, see Stein (1988), Shleifer and Vishny (1990), Lipton and Rosenblum (1991).

# A Appendix

This Appendix contains the proof for the case where the ED is not renegotiable.

## A.1 The incumbent invests

**Proof of Lemma 1**

Under exclusivity, the incumbent solves:

$$\max_x \left[ \frac{v_I + x}{2} - \gamma \frac{x^2}{2} \right]$$

The optimal level investment is identified by the FOC

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

Absent exclusivity, it is never optimal to invest if $x \leq (v_E - v_I)/(1-\lambda)$. Investing $x > (v_E - v_I)/(1-\lambda)$ makes the incumbent earn the profit:

$$\pi_I(x) = \frac{v_I + x - v_E - \lambda x}{2} - \gamma \frac{x^2}{2}.$$

The level of investment which satisfies the FOC

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

is globally optimal iff

$$\pi_I(x^*) = \frac{1}{2}\left( v_I + \frac{1-\lambda}{2\gamma} - v_E - \lambda \frac{1-\lambda}{2\gamma} \right) - \gamma \frac{(1-\lambda)^2}{8\gamma^2} > 0 \tag{6}$$

Condition (6) is satisfied iff

$$\gamma < \frac{(1-\lambda)^2}{4(v_E - v_I)} \equiv \overline{\gamma}.$$

**Proof of Lemma 3**

**Case (i): Positive external effect.** Take the investment fixed at $x = x^{*NoED}$. Introducing exclusivity causes the incumbent a gain which is (weakly) lower than the buyer's loss (see Table 1):[31]

$$\begin{aligned} \Delta\pi_I(x^{*NoED}) &= \pi_I^{ED}(x^{*NoED}) - \pi_I^{NoED}(x^{*NoED}) && (7) \\ &\leq -[\pi_B^{ED}(x^{*NoED}) - \pi_B^{NoED}(x^{*NoED})] = -\Delta\pi_B(x^{*NoED}) && (8) \end{aligned}$$

Also, by Lemma 2, when $\lambda > 0$ ED stimulates the investment ($x^{*ED} > x^{*NoED}$). By revealed preferences, this increases the incumbent's payoff under exclusivity as well as the buyer's payoff ($\pi_B^{ED}(x) = (v_I + x)/2$ is increasing in $x$), thereby expanding the incumbent's gain and mitigating the buyer's loss.

When $\gamma < \overline{\gamma}$, by Lemma 1, $x^{*NoED}$ is such that $v_I + x^{*NoED} > v_E + \lambda x^{*NoED}$. Hence, condition (7) holds as an equality. It follows that ED, by promoting investment, makes the incumbent's gain

[31] We define as $\Delta\pi_i$ with $i = I, B$ the change of surplus of agent $i$ due to the introduction of exclusivity.

larger than the buyer' loss and the incumbent is always able to elicit acceptance is a profitable way:

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

When $\gamma \geq \overline{\gamma}$, by Lemma 1, $x^{*NoED} = 0$. Since $v_I < v_E$ by assumption, condition 7 holds as a strict inequality. Hence, investment promotion must be strong enough to revert the inequality and make the incumbent's gain larger than the buyer's loss:

$$\frac{v_I + x^{*ED}}{2} - \gamma\frac{(x^{*ED})^2}{2} > \frac{v_I + v_E}{2} - \frac{v_I + x^{*ED}}{2} \tag{9}$$

where $x^{*ED} = 1/(2\gamma)$. Condition (9) is satisfied iff

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

**Case (ii): Negative external effect.**

By Lemma 2, if $\gamma \geq \overline{\gamma}$, ED promotes investment also when the external effect is negative. The analysis made for the case of positive external effect applies: the ED is signed iff $\gamma < \gamma^s$. However, $\gamma^s > \overline{\gamma}$ iff $\lambda > 1 - \sqrt{3} \equiv \lambda^s$ with $\lambda^s < 0$. Then, the ED is signed iff $\lambda \in (\lambda^s, 0]$ and $\gamma \in [\overline{\gamma}, \gamma^s)$.

Instead, if $\gamma < \overline{\gamma}$ and the external effect is negative, ED limits investment: $x^{*ED} < x^{*NoED}$. Take the investment fixed at $x = x^{*ED}$. When $\gamma < \overline{\gamma}$, $x^{*ED}$ is large enough to make the incumbent ex-post more efficient: $v_I + x^{*ED} > v_E + \lambda x^{*ED}$ (more precisely, $v_I + x^{*ED} > v_E + \lambda x^{*ED}$ iff $\gamma < \widehat{\gamma}$ with with $\widehat{\gamma} \equiv (1-\lambda)/2(v_E - v_I) > \overline{\gamma}$ for any feasible value of $\lambda$). It follows that introducing exclusivity (keeping the investment fixed at $x^{*ED}$) causes the incumbent a gain which coincides with the buyer's loss (see Table 1):

$$\Delta\pi_I(x^{*ED}) = \pi_I^{ED}(x^{*ED}) - \pi_I^{NoED}(x^{*ED}) \tag{10}$$

$$= -\left[\pi_B^{ED}(x^{*ED}) - \pi_B^{NoED}(x^{*ED})\right] = -\Delta\pi_B(x^{*ED}) \tag{11}$$

However, introducing exclusivity also limits the investment. The higher investment chosen when exclusivity is absent increases both the incumbent and the buyer's payoff absent exclusivity (the former by revealed preferences, the latter because $\pi_B^{NoED}(x) = (v_I + x + v_E + \lambda x)/2$ and $\lambda \geq -1$), thereby decreasing the incumbent's gain and increasing the buyer's loss. It follows that it is never in $B$ and $I's$ joint interest to introduce exclusivity:

$$\begin{aligned}
\pi_I^{ED}(x^{*ED}) - \pi_I^{NoED}(x^{*NoED}) &< \pi_I^{ED}(x^{*ED}) - \pi_I^{NoED}(x^{*ED}) \\
&= \Delta\pi_I(x^{*ED}) \\
&= -\Delta\pi_B(x^{*ED}) \\
&= \pi_B^{NoED}(x^{*ED}) - \pi_B^{ED}(x^{*ED}) \\
&< \pi_B^{NoED}(x^{*NoED}) - \pi_B^{ED}(x^{*ED}).
\end{aligned}$$

(When $\lambda = 0$, ED has no effect on investment and ED may be signed by indifference.)

Note that when exclusivity is absent, higher investment has a *contrasting effect* on the buyer's payoff. On the one hand, higher investment increases the value of trade with the incumbent, which benefits the buyer; on the other hand, higher investment deteriorates the value of trade with firm $E$ which is detrimental to the buyer. Since we assume that the external effect is weaker than the external one (i.e. $\lambda \geq -1$), the former effect prevails and, absent exclusivity, the buyer is (weakly) better off when the investment is higher. If we allowed the negative external effect to be stronger than the internal one, higher investment would harm the buyer absent exclusivity. If this effect was strong enough, $B$ and $I's$ joint payoff would be higher when the ED is signed. Differently from the case where the external effect is positive, $B$ and $I$ would have an incentive to enter into an exclusive dealing contract because it *stifles* (rather than stimulates) the investment. An analogous argument applies if we maintain the restriction $\lambda > -1$ and we allow for $b < 1/2$.The buyer's payoff absent exclusivity would be given by $\pi_B = b(v_I + x) + (1-b)(v_E + \lambda x)$. If $\lambda < -b(1-b)$, higher investment harms the buyer. If $\lambda < -2b/(1-b)$, $B$ and $I$ are jointly better off under exclusivity.

**Proof of Proposition 1**

When $\gamma < \overline{\gamma}$, firm $E's$ payoff is zero with and without the ED. Hence, total welfare coincides with $B$ and $I's$ joint payoff and ED is welfare beneficial whenever $B$ and $I$ have an incentive to sign it.

When $\gamma \geq \overline{\gamma}$, firm $E$ is harmed by the introduction of exclusivity, because it supplies the buyer absent ED. Exclusive deal is welfare detrimental iff investment promotion is not strong enough to make the increase in $B$ and $I's$ joint payoff dominate the loss suffered by firm $E$ :

$$\frac{v_I + x^{*ED}}{2} - \gamma\frac{(x^{*ED})^2}{2} + \frac{v_I + x^{*ED}}{2} - \frac{v_I + v_E}{2} < \frac{v_E - v_I}{2} \tag{12}$$

Condition (12) is satisfied iff

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

Note that $\gamma^w > \overline{\gamma}$ for any $\lambda > 0$. Hence, when the external effect is positive, the ED is signed and is welfare detrimental iff $\gamma \in (\gamma^w, \gamma^s)$ . Instead, when $\lambda \leq 0$ $\gamma^w > \overline{\gamma}$ iff $\lambda > 1 - \sqrt{3/2} \equiv \lambda^{ww} > \lambda^s$ with $\lambda^{ww} < 0$. Hence, when $\lambda \in (\lambda^s, \lambda^{ww}]$, whenever the ED is signed it is welfare detrimental; when $\lambda \in (\lambda^{ww}, 0]$, ED is signed and is welfare detrimental if $\gamma \in (\gamma^{ww}, \gamma^s)$.

## A.2 The buyer invests

**Proof of Proposition 2**

**Case (i): Negative external effect.** Take the investment fixed at $x = x^{*NoED}$. Introducing exclusivity causes the incumbent a gain which is (weakly) lower than the buyer's loss (see Table 1):

$$\Delta\pi_I(x^{*NoED}) = \pi_I^{ED}(x^{*NoED}) - \pi_I^{NoED}(x^{*NoED}) \tag{13}$$

$$\leq -[\pi_B^{ED}(x^{*NoED}) - \pi_B^{NoED}(x^{*NoED})] = -\Delta\pi_B(x^{*NoED}) \tag{14}$$

Also, by Lemma 4, when $\lambda < 0$ ED stimulates the investment ($x^{*ED} > x^{*NoED}$). By revealed preferences, this increases the buyer's payoff under exclusivity as well as the incumbent's payoff ($\pi_I^{ED}(x) = (v_I + x)/2$ is increasing in $x$), thereby expanding the incumbent's gain and mitigating the buyer's loss.

When $\gamma \leq \widehat{\gamma}^{\circ} \equiv (1-\lambda^2)/2(v_E - v_I)$, $x^{*NoED}$ is such that $v_I + x^{*NoED} > v_E + \lambda x^{*NoED}$ and $\Delta\pi_I(x^{*NoED}) = -\Delta\pi_B(x^{*NoED})$. It follows that ED, by promoting investment, makes the incumbent's gain larger than the buyer' loss and the incumbent is always able to elicit acceptance is a profitable way:

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

Note that in this case firm $E's$ payoff is zero with and without the ED. Hence, total welfare coincides with $B$ and $I's$ joint payoff and ED is welfare beneficial whenever $B$ and $I$ have an incentive to sign it. (When $\lambda = 0$, ED has no effect on investment and ED may be signed by indifference.)

When $\gamma > \widehat{\gamma}^{\circ}$, $x^{*NoED}$ is such that $v_I + x^{*NoED} < v_E + \lambda x^{*NoED}$ and $\Delta\pi_I(x^{*NoED}) < -\Delta\pi_B(x^{*NoED})$. Hence, investment promotion must be strong enough to revert the inequality and make the incumbent's gain larger than the buyer's loss:

$$\frac{v_I + x^{*ED}}{2} > \frac{v_I + x^{*NoED}}{2} + \frac{v_E + \lambda x^{*NoED}}{2} - \frac{\gamma}{2}(x^{*NoED})^2 - \frac{v_I + x^{*ED}}{2} + \frac{\gamma}{2}(x^{*ED})^2 \tag{15}$$

where $x^{*NoED} = (1+\lambda)/(2\gamma)$ and $x^{*ED} = 1/(2\gamma)$. Condition 15 is satisfied iff

$$\gamma < \frac{2 - 2\lambda - \lambda^2}{4(v_E - v_I)} \equiv \widetilde{\gamma}^s > \widehat{\gamma}^{\circ}.$$

Note that in this case firm $E$ is harmed by the introduction of exclusivity, because it supplies the buyer absent ED. Exclusive deal is welfare detrimental iff investment promotion is not strong enough to make the increase in $B$ and $I's$ joint payoff dominate the loss suffered by firm $E$ :

$$v_I + x^{*ED} - \frac{\gamma}{2}(x^{*ED})^2 - \left(\frac{v_I + x^{*NoED}}{2} + \frac{v_E + \lambda x^{*NoED}}{2} - \frac{\gamma}{2}(x^{*NoED})^2\right) < \frac{v_E + \lambda x^{*NoED} - v_I - x^{*NoED}}{2} \tag{16}$$

Condition (16) is satisfied iff

$$\gamma > \frac{4 - 2\lambda - 3\lambda^2}{8(v_E - v_I)} \equiv \widetilde{\gamma}^w$$

where $\widehat{\gamma}^{\circ} < \widetilde{\gamma}^w < \widetilde{\gamma}^s$ for $\lambda < 0$.

**Case (ii): Positive external effect.**

By Lemma 4, ED limits investment: $x^{*ED} < x^{*NoED}$. Take the investment fixed at $x = x^{*ED}$. Introducing exclusivity (keeping the investment fixed at $x^{*ED}$) causes the incumbent a gain which is (weakly) lower than the buyer's loss (see Table 1):

$$\Delta\pi_I(x^{*ED}) = \pi_I^{ED}(x^{*ED}) - \pi_I^{NoED}(x^{*ED}) \tag{17}$$

$$\leq -\left[\pi_B^{ED}(x^{*ED}) - \pi_B^{NoED}(x^{*ED})\right] = -\Delta\pi_B(x^{*ED}) \tag{18}$$

Also, introducing exclusivity limits the investment. The higher investment chosen when exclusivity is absent increases both the incumbent and the buyer's payoff absent exclusivity (the

latter by revealed preferences, the former because $\pi_I^{NoED}(x) = \max\{0, v_I + x - v_E - \lambda x)/2\}$ and $\lambda < 1$), thereby decreasing the incumbent's gain and increasing the buyer's loss. It follows that it is never in $B$ and $I's$ joint interest to introduce exclusivity:

$$\begin{aligned}
\pi_I^{ED}(x^{*ED}) - \pi_I^{NoED}(x^{*NoED}) &< \pi_I^{ED}(x^{*ED}) - \pi_I^{NoED}(x^{*ED}) \\
&= \Delta\pi_I(x^{*ED}) \\
&= -\Delta\pi_B(x^{*ED}) \\
&= \pi_B^{NoED}(x^{*ED}) - \pi_B^{ED}(x^{*ED}) \\
&< \pi_B^{NoED}(x^{*NoED}) - \pi_B^{ED}(x^{*ED}).
\end{aligned}$$

Note that when exclusivity is absent, higher investment has a *contrasting effect* on the incumbent's payoff: by increasing the internal value, it makes the incumbent more efficient, but by increasing the external value it also makes the rival supplier more efficient. Since we assume that the external effect is weaker than the internal one, the former effect prevails and, absent exclusivity, the incumbent is (weakly) better off when investment is higher.

# B Appendix

This Appendix contains the proofs for the case where the ED is renegotiable.

## B.1 The incumbent invests

**Proof of Proposition 3**

In order to evaluate when $B$ and $I$ have an incentive to agree on exclusivity and the associated welfare effects it helps distinguishing between the following two cases:

**Case 1:** $\gamma < \widehat{\gamma}$. In this case the investment chosen under exclusivity is large enough to make the incumbent ex-post more efficient ($v_I + x^{*ED} > v_E + \lambda x^{*ED}$). Hence, the possibility to renegotiate the initial contract is immaterial and the results obtained when ED is not renegotiable apply. It follows that:

(a) when $\gamma < \overline{\gamma}$, the ED is signed in equilibrium if and only if the external effect is positive (when $\lambda = 0$, the ED may be signed by indifference); when the ED is signed it is welfare beneficial.

(b) when $\gamma \in [\overline{\gamma}, \widehat{\gamma})$, the ED is signed iff $\gamma < \gamma^s$. Recall that $\gamma^s > \overline{\gamma}$ iff $\lambda > \lambda^s \equiv 1 - \sqrt{3} < 0$ and note that $\gamma^s > \widehat{\gamma}$ iff $\lambda > \lambda^{ss} \equiv -1/2$. Hence, in this case the ED is signed either for any $\lambda \in (\lambda^s, \lambda^{ss})$ and $\gamma \in [\overline{\gamma}, \gamma^s)$; or for any $\lambda \geq \lambda^{ss}$ and $\gamma \in [\overline{\gamma}, \widehat{\gamma})$.

The ED is welfare detrimental iff $\gamma > \gamma^w$.Recall that $\gamma^w > \overline{\gamma}$ iff $\lambda > 1 - \sqrt{3/2} \equiv \lambda^{ww} > \lambda^{ss}$ with $\lambda^{ww} < 0$. Also, note that $\gamma^w < \widehat{\gamma}$ iff $\lambda < 1/4 \equiv \lambda^w$. Hence, in this case the ED is welfare detrimental either for any $\lambda \in (\lambda^s, \lambda^{ww})$ and $\gamma \in [\overline{\gamma}, \min\{\gamma^s, \widehat{\gamma}\})$; or for any $\lambda \in [\lambda^{ww}, \lambda^w)$ and $\gamma \in (\gamma^w, \widehat{\gamma})$.

**Case 2:** $\gamma \geq \widehat{\gamma}$. In this case the possibility to renegotiate matters. More precisely, let us introduce exclusivity keeping the investment fixed at the level $x^{*NoED} = 0$ chosen by the incumbent absent

ED. The possibility to renegotiate removes foreclosure of the more efficient supplier $E$ and makes the incumbent's gain equal to the buyer's loss:

$$\Delta\pi_I(x^{*NoED}) = \pi_I^{ED}(x^{*NoED}) - \pi_I^{NoED}(x^{*NoED}) \tag{19}$$

$$= \pi_B^{NoED}(x^{*NoED}) - \pi_B^{ED}(x^{*NoED}) = -\Delta\pi_B(x^{*NoED}) \tag{20}$$

However, remember that $\widehat{\gamma} > \overline{\gamma}$ so that ED stimulates the investment ($x^{*ED} > x^{*NoED}$). Higher investment increases the incumbent's payoff under exclusivity (by revealed preferences), while the effect on the buyer's payoff depends on the sign of the external effect. The reason is that $x^{*ED}$ is not large enough to make the incumbent ex-post more efficient; then for $x \in \left[0, x^{*ED}\right]$ the buyer's payoff under exclusivity is $\pi_B^{ED}(x) = (v_E + \lambda x)/2$.

It follows that, when the external effect is positive, the investment stimulated by ED benefits also the buyer. Hence, the buyer's loss due to exclusivity is mitigated and the incumbent's gain is expanded, making the latter dominate. The incumbent can always elicit the buyer's acceptance in a profitable way.

Instead, when the external effect is negative, the higher investment stimulated by ED expands not only the incumbent's gain from exclusivity, but also the buyer's loss. Then, it is not necessarily the case that $B$ and $I$ have a private incentive to sign the ED. ED arises in equilibrium iff:

$$\frac{v_I + x^{*ED}}{2} - \gamma\frac{(x^{*ED})^2}{2} > \frac{v_I + v_E}{2} - \frac{v_E + \lambda x^{*ED}}{2} \tag{21}$$

The stronger the negative external effect, the larger the buyer's loss, the less likely that the incumbent's gain dominates. It turns out that the ED is signed iff

$$\lambda > -\frac{1}{2} \equiv \lambda^{ss}.$$

Hence, in this case the ED is signed for any $\lambda \in (\lambda^{ss}, 0]$ and $\gamma \geq \widehat{\gamma}$.

Since the initial contract is renegotiable, firm $E$ supplies the buyer also when the ED is in place, but the investment promoted by ED reduces its efficiency advantage (recall that $\lambda < 1$) and its payoff. In this case the condition such that firm $E$'s loss dominates the joint gain of $B$ and $I$ is:

$$\frac{v_I + x^{*ED}}{2} - \gamma\frac{(x^{*ED})^2}{2} + \frac{v_E + \lambda x^{*ED}}{2} - \frac{v_I + v_E}{2} < \frac{v_E - v_I}{2} - \frac{v_E + \lambda x^{*ED} - v_I - x^{*ED}}{2}$$

This condition boils down to

$$\lambda x^{*ED} - \gamma\frac{(x^{*ED})^2}{2} < 0$$

and is satisfied iff

$$\lambda < 1/4 \equiv \lambda^w.$$

Hence, in this case the ED is welfare detrimental for any $\lambda \in (\lambda^{ss}, \lambda^w]$ and $\gamma \geq \widehat{\gamma}$..

To summarize, when the external effect is positive, the ED is always signed in equilibrium. It is welfare detrimental iff $\lambda \in (0, \lambda^w)$ and $\gamma \geq \gamma^w$. If the external effect is (weakly) negative, the ED is signed iff $\lambda \in (\lambda^s, \lambda^{ss})$ and $\gamma \in [\overline{\gamma}, \gamma^s)$- in this case, the signed contract is always welfare detrimental; or $\lambda \in [\lambda^{ss}, 0]$ and $\gamma \geq \overline{\gamma}$ - in this case the signed contract is welfare detrimental for any $\gamma > \max\{\overline{\gamma}, \gamma^w\}$.

## References


[1] Aghion P. and Bolton P. (1987), "Contracts as a Barrier to Entry", *American Economic Review,* June, 77(3), 388-401.

[2] Aghion P. and Hermalin B. (1990), "Legal Restrictions on Private Contracts Can Enhance Efficiency", *Journal of Law, Economics and Organization,* 6, 381-409.

[3] Bebchuck L. A. (2003), "Why Firms Adopt Antitakeover Arrangements", *University of Pennsylvania Law Review*, 152, 713-53.

[4] Bernheim B. D. and M. D. Whinston (1998), "Exclusive Dealing", *The Journal of Political Economy,* 106(1), 64-103.

[5] Besanko D. and Perry M. K. (1993), "Equilibrium Incentives for Exclusive Dealing in a Differentiated Products Oligopoly", *RAND Journal of Economics,* 24, 646-667.

[6] Bork, R. (1978), *The Antitrust Paradox.* New York: Basic Books.

[7] Chung, T.-Y., (1992), "On the Social Optimality of Liquidated Damage Clauses: An Economic Analysis", *Journal of Law, Economics and Organization*, 8, 280-305.

[8] Cooter R. and T. Ulen, *Law and Economics.* Boston, MA: Addison Wesley, 2004.

[9] De Frutos, M.A., N. Fabra and N.H. von der Fehr (2008), "Investment Incentives and Market Design", CEPR Discussion Paper No. 6626.

[10] DeMeza D. and Selvaggi M., (2007) "Exclusive Contracts Foster Relationship-Specific Investments", *RAND Journal of Economics,* 38(1), 85-97.

[11] Director, A. and E. Levi (1956), "Law and the future: Trade regulation", *North Western University Law Review,* 51: 281-296.

[12] Easterbrook, F. H. and D. R. Fishel, (1981), "The Proper Role of a Target's Management in Responding to a Tender Offer", *Harvard Law Review*, 94, 1162-1204.

[13] Edlin, A. and S. Reichelstein (1996), "Holdups, Standard Breach Remedies, and Optimal Investment", *American Economic Review*, Vol 86, 478-501.

[14] Fumagalli, C. and M. Motta (2006), "Exclusive Dealing and Entry when Buyers Compete", *American Economic Review,* 96(3), 785-795.

[15] Ganuza, J., G. Llobet and B. Domínguez (2008), "R&D in the Pharmaceutical Industry: A World of Small Innovations", *forthcoming in Management Science.*

[16] Gilson, R. (1999), "The Legal Infrastructure of High Technology Industrial Districts: Silicon Valley, Route 128, and Covenants Not to Compete", *New York University Law Review*, 74, 575-629.

[17] Glick, M. A., D. Bush and J. Q. Hafen (2002), "The Law and Economics of Post-Employment Covenants: A Unified Framework", *George Mason Law Review*, 11, 357-418.

[18] Groh C., and G. Spagnolo (2004), "Exclusive Contracts, Loss to Delay and Incentives to Invest", CEPR Discussion Paper No. 4525.

[19] Grossman S.J. and O. D. Hart (1986), "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration", *Journal of Political Economy,* 94, 691-719.

[20] Hannes S. (2006), "A Demand-Side Theory of Antitakeover Defenses", *Journal of Legal Studies,* 35, 474-524.

[21] Hart, O. (1995), *Firms, Contracts and Financial Structure,* Oxford: Oxford University Press.

[22] Hart, O. and J. Moore (1990), "Property Rights and the Nature of the Firm", *Journal of Political Economy,* 98, 1119-1159.

[23] Hatzis A. N. (2001), "Having the Cake and Eating It Too: Efficient Penalty Clauses in Common and Civil Contract Law", *mimeo,* University of Athens.

[24] Hermalin B and M. Katz (1993), "Judicial Modification of Contracts between Sophisticated Parties: A More Complete View of Incomplete Contracts and their Breach", *Journal of Law, Economics and Organization,* 9, 230-255.

[25] Hyde, A. (2001), "The wealth of shared information: Silicon Valley's high velocity labor market, endogenous economic growth and the law of trade secrets", Unpublished manuscript, Rutgers University.

[26] Inderst, R. and C. Wey (2007), "Countervailing Power and Dynamic Efficiency", *mimeo*, University of Frankfurt.

[27] Jacobson, J. M. (2002), "Exclusive dealing, "foreclosure", and consumer harm," *Antitrust Law Journal*, No. 2, 311-369.

[28] Kahan M. and E. B. Rock (2003), "Corporate Constitutionalism: Antitakeover Charter Provisions as Pre-commitment", *University of Pennsylvania Law Review*, 152, 473-522.

[29] Leitzel, J. (1989), "Damage Measures and Incomplete Contracts", Rand Journal of Economics, 20, 92-101.

[30] Lipton, M. (1979), "Takeover Bids in the Target's Boardroom", *Business Lawyer*, 35, 101-134.

[31] Lipton, M. (2002), "Pills, Polls, and Professors Redux", *University of Chicago Law Review*, 1037.

[32] Lipton, M. and S. Rosenblum, (1991), "A New System of Corporate Governance: the Quinquennial Election of Directors", *University of Chicago Law Review*, 58, 187-214.

[33] Macaulay S., J. Kidwell, W. Whitford and M. Galanter (1995), *Contracts: Law in Action*, Charlottesville, VA: Michie Co.

[34] Posner, R.A. (1976), *Antitrust Law: An Economic Perspective.* Chicago: University of Chicago Press.

[35] Rasmusen E.B., Ramseyer J. M. and Wiley J. J. S. (1991), "Naked Exclusion", *American Economic Review,* December, 81(5), 1137-45.

[36] Romano R. (1992), "A Guide to Takeovers: Theory, Evidence, and Regulation", *Yale Journal on Regulation*, 9, 119-180.

[37] Rubin, P. and P. Shedd (1981), "Human Capital and Covenants not to Compete", *The Journal of Legal Studies*, 10, 93-110.

[38] Segal I. and Whinston M.D. (2000a), "Naked Exclusion: Comment", *American Economic Review,* 90(1), 296-309.

[39] Segal I. and Whinston M.D. (2000b), "Exclusive Contracts and Protection of Investments", *RAND Journal of Economics,* 31(4), 603-633.

[40] Shavell S. (1980), "Damage Measures for Breach of Contracts", *Bell Journal of Economics,* 11, 466-490.

[41] Shleifer A. and R. W. Vishny (1990), "Equilibrium Short Horizons of Investors and Firms", *American Economic Review*, 80, 148-153.

[42] Simpson, J., and A. L. Wickelgren (2007): "Naked Exclusion, Efficient Breach, and Downstream Competition", *American Economic Review*, 97, 1305–1320.

[43] Spier, K. E. and M. D. Whinston (1995), "On the efficiency of privately stipulated damages for breach of contract: entry barriers, reliance, and renegotiation", *RAND Journal of Economics*, 26(2), 180-202.

[44] Stein, J. C. (1988), "Takeover Threats and Managerial Myopia", *Journal of Political Economy*, 96, 61-80.

[45] Stole, L. A. (1992), "The Economics of Liquidated Damage Clauses in Contractual Environments with Private Information", *Journal of Law, Economics and Organization,* 8, 582-606.

[46] Stout L. and M. Blair (1999), "A Team Production Theory of Corporate Law", *Virginia Law Review*, 85, 247-305.

[47] Stout L. (2002), "Do Antitakeover Defenses Decrease Shareholder Wealth? The Ex Ante/ Ex Post Valuation Problem", *Stanford Law Review,55*, 845-62.

[48] Vasconcelos L., (2008), "Contractual Signalling, Relationship-Specific Investment and Exclusive Agreements", *mimeo,* Universidade Nova de Lisboa. Electronic copy available at: http://ssrn.com/abstract=931427

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