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Incomplete Contracts, Irreversible Investments and Entry Deterrence

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Abstract - When renegotiation under incomplete contracts follows the outside option principle, hold-up may occur as the ex-post degree of competition increases on investor's side. However, under this framework, asset specificity may play the counterintuitive role of an entry deterrence device, thus decreasing the probability of hold-up. Our result contrasts with standard literature in three respects: i) an equilibrium with overinvestment may emerge; ii) the 'intimidating effect' of overinvestment acts as an endogenous enforcement device; iii) a pervasive trade-off may emerge between ex-post efficient entry and ex-ante efficient specific investments.

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1. Introduction

Irreversible investments play two opposite roles in two different streams of literature: while the literature on incomplete contracts depicts irreversible investments as the source of vulnerability against counterparty's post-contractual power (Klein, Crawford and Alchian, 1978; Williamson, 1985), the literature on strategic entry deterrence outlines the conditions under which long-term monopolistic rents might be sustained by irreversible investments (Spence, 1977; Dixit, 1980).

In this paper we show that specific investments, by deterring entry, may endogenously enforce incomplete contracts. We focus on an incomplete contract framework with one-sided specific investment by seller and potential entry on seller's side. Our intuition is that, under given conditions, entrant's payoffs are adversely affected by the specificity degree of the investment made by the incumbent seller. Then the incumbent seller might have a strong incentive to overinvest in specificity, with the purpose of deterring entry. In this setting, breach penalties and specific over-investment are strategic substitutes.

2. The Model

Let us consider a simple contract A, between a group of buyers B and a seller S concerning the delivery of a widget.

(A) Assumptions

For simplicity's sake, let us assume that the group of buyers acts as a unique agent, bargaining one standard contract with the seller.

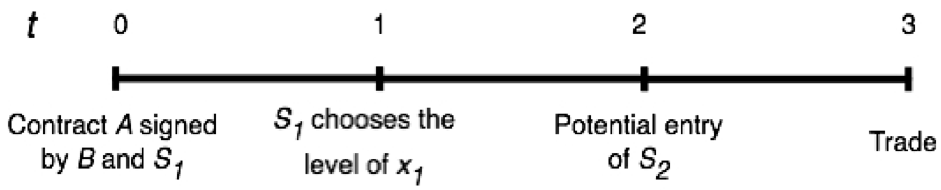
(i) Let us assume that demand is given by $p(q)=1-q$, where q is the quantity of the widget delivered. Under bilateral monopoly, seller's payoff is given by $\Pi=(1-q-c_1)q$ where $c_1=c-x_1$ represents the production costs.

(ii) In particular, we consider the case of an investment x_1 with $x_1 \in R^+$ which influences seller's cost of production $c_1(x_1)$ with $\frac{\partial c_1}{\partial x_1}<0$ and $\frac{\partial^2 c_1}{\partial x_1 \partial x_1}<0$. We assume this investment is specific or irreversible in alternative uses, thus it takes the form of a sunk investment given by $f(x_1)=(x_1)^2$.

(iii) The contract is incomplete, which means its agreed terms (price and investments) are observable but unverifiable. Let us assume that only the seller can make specific self-investments.

(iv) Moreover, we assume that $c_1(0)<\overline{P}$ where $\overline{P}$ is the buyer's commonly known reserve price, namely trade is always efficient and that $\exists x_1 > 0 : c_1(x_1) < \overline{P}$, in other words, an efficient trade with specific investment exists.

(v) Contractual timeline is as follows: at the starting date of the contract, $t = 0$, agents meet and agree on price and investments through a contract $A = (p;x)$. At $t = 1$, investment decisions x are made, while at $t = 2$, parties exchange or renegotiate.



We assume that entry occurs at $t = 2$, and that the entrant (seller 2) maintains identical production costs of seller 1, with $c_2 = c - x_2$ and x_2 being the level of investment for new entrant, as defined for the incumbent. Entrant has to pay $F>0$ fixed costs and entry generates a Cournot equilibrium on seller's side. When the buyer's outside option turns to be binding ex post, the buyer may purchase at the new price from the original seller or she can split her demand - as in a Cournot-like case - at the new price between the old and the new seller.The outside option principle applies[1]

[1] See Binmore, Shaked and Sutton (1989), Osborne and Rubinstein (1990).

and the renegotiation game takes the form of an infinitely repeated bargaining game with alternate offers (Osborne and Rubinstein, 1990) and buyer's outside option, where first proposer is the seller and the first responder is the buyer[2].

(B) Hold Up by Competition without Entry Costs

Under the above assumptions, hold-up occurs when buyer turns to have a binding outside option. Let consider first the case where entrant's fixed costs are zero (*F*=0).

Proposition 1

When entry occurs at t=2, buyer's renegotiation leads to hold up. Anticipating this, the seller will underinvest at $t=1$.

Proof.

By assumption, after entry, a Cournot duopoly occurs. Thus sellers' payoffs are given by $\Pi_i^C = (1-q_i-q_j-c_i)q_i, \ \forall\, i,j=1,2$ with $i \neq j$. If entry does not occur, seller 1 obtains ex-post monopoly profit given by

[2] We assume that buyer accepts any proposal which provides her with ex post outside options plus a small enough amount . As shown by Osborne and Rubinstein (1990), given that the seller will propose to the buyer the highest value between the price agreed upon and buyer's outside option, parties will reach an immediate Nash equilibrium which gives parties either the surplus sharing agreed upon or the one resulting from giving the buyer her binding outside option.

$$x_1^M = \arg\max \ \Pi^M = \frac{(1-c+x_1)^2}{4}.$$

Since $\Pi_1^C = \frac{(1-c+2x_1-x_2)}{9} < \Pi = \frac{(1-c+x_1)^2}{4}$, seller will be induced to underinvest.

(C) Over-investment with Positive Entry Costs

Let us now focus on the case of an entrant facing positive fixed costs $F > 0$. Then we have the following proposition.

Proposition 2

With positive fixed entry costs, the incumbent may strategically increase the degree of specific investment with the purpose of to deterring entry.

Proof.

With positive fixed entry costs, entrant's profits will be given by $\Pi_2^C = \frac{(1-2c_2+c_1)}{9} - F - (x_2)^2 = \frac{(1-c+2x_2-x_1)^2}{9} - F - (x_2)^2$. Thus. seller 2's profits are negatively correlated with seller 1's investment levels and with entry costs. Entry is deterred if investment level is selected at $t=1$ by seller 1 such as to determine negative profits for the new entrant.

This level is equal to $x_1^{OD} \geq 1 - c + 2x_2 - 3\sqrt{F + (x_2)^2}$ (the apex OD stands for optimal deterrence level). Then we have the following cases:

a) if $x_1^{UI} \geq x_1^{OD}$, entry is deterred even if incumbent underinvests;

b) if $x_1^{UI} < x_1^{OD} < x^*$, the incumbent will select the optimal level of investment for deterring entry;

c) if $x_1^{UI} = x_1^{OD} > x^*$, in order to deter entry, seller 1 will over-invest as long as $\Pi_1^M(x_1^{OD}) \geq \Pi_1^C(x_1^{UI})$, otherwise she will under-invest.

■

Proposition 2 shows how, under certain conditions, efficient specific investments may also deter entry when $x_1^{UI} < x_1^{OD} < x^*$. This is quite a novel result with respect to standard hold-up theory, since the degree of asset specificity actually *reduces* rather than increases the probability of hold-up. In particular, the higher the level of barrier entry F, the lower is the level of incumbent's strategic investments to deter entry.

(D) The Countervailing Effect of Breach Penalties

Let us now assume that parties may contract breach penalties on observable exit (Aghion and Bolton, 1987; Spier and Whinston, 1995). Depending on the level of entry costs, breach penalties may play a countervailing effect on seller 1 's strategic choice to over-invest. Assume that a breach penalty like p^A should be paid by buyer upon exit. As in Aghion and Bolton (1987), this breach penalty has the immediate effect of reducing actual price for the incumbent seller, while raising barriers to entry:

$$\Pi_2^C = \frac{(1-2c_2+c_1)^2}{9} - F - (x_2)^2 - \lambda p^A = \frac{(1-c+2x_2-x_1)^2}{9} - F - (x_2)^2 - \lambda p^A,$$

where λ is the portion of the breach penalty paid by seller 2, with $0 < \lambda \leq 1$. Then, we have the following proposition.

Proposition 3

The higher is the breach penalty, the lower is the level of strategic specific investments needed to deter entry, and vice versa.

Proof.

It is sufficient to notice that under breach penalties the threshold value of strategic deterring investment is given by $x_1^{\overline{\overline{OD}}} = 1 - c + 2x_2 - 3\sqrt{F + (x_2)^2 + \lambda p^A}$. In particular, the modification of strategic investments due to presence of breach penalties is equal to $3\left(\sqrt{F + (x_2)^2} - \sqrt{F + (x_2)^2 + \lambda p^A}\right)$. Since this value turns out to be negative, breach penalies play a countervailing effect on strategic specific over-investments.

■

Proposition 3 outlines another important result: under our framework, breach penalties and specific (over)investment are strategic substitutes. This is a counterintuitive conclusion, since the literature stresses the opposite (Spier and Whinston, 1995; Chung, 1998). Moreover, this result suggests that breach penalties might increase overall efficiency by reducing seller 1's incentives to overinvest.

5. Conclusions

Our results reverse some of the main conclusions of standard hold-up theories: we obtain an overinvestment rather than an underinvestment equilibrium; overinvestment acts as an enforcement device against hold-up. Moreover, efficient breach penalty restores incentives to invest efficiently with respect not only to underinvestment but also to overinvestment decisions. Absent breach penalties, when entry deterrence would be reached in any case through incumbent's overinvestment, breach penalties may reduce to some extent the inefficiency associated to overinvestment.

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