When Do Property Rights Really Matter?
Hold-up, Competition and Vertical Integration

by

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Abstract

This paper extends the framework provided by the so-called New Property Rights School, in a context of endogenous outside options. We show how the optimality of property rights assignment might be affected by the emergence of endogenous outside options. In some cases, non-owners could over-invest in specific assets while having mere access to property rights might not prevent hold-up by counterparts. Our conclusions suggest that in order to reach the desired optimality features, the design of ownership structure should take into account the dynamics of outside options, i.e. market competition on seller’s and buyer’s side, to achieve the desired balance between ex-ante and ex-post efficiency.

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1. Introduction

In this paper we compare traditional new Institutional literature in incomplete contract with the literature on entry deterrence and raising rivals’ costs in the literature on industrial organization. The standard literature on incomplete contracts (Hart and Moore, 1990; Hart, 1995; Williamson, 1985) has focused on the hold-up problem that arises in the absence of ex-post verifiability. Investment in specific assets may expose investors to the risk of opportunistic behaviour by contractual counterparts, who may impose a renegotiation of the terms contracted upon (the so-called hold-up problem). Under this framework, contractual parties maintain strong incentives to under-invest in asset specificity due to the risk of counterpart’s opportunistic behaviour, the potential quasi-rents which might be generated by specific investments are almost completely dissipated. New Institutional and Transaction Cost Economics (Klein, Crawford and Alchian, 1978; Williamson, 1985; Hart, 1995) have outlined a theory of the emergence of vertical integration and private orderings (such as contracts and economic organisations) as institutional solutions to hold-up.

We argue that most of the theories on incomplete contracts are generally based on a very peculiar notion of market transaction, focused on bilateral relationships and derived from the idea that the degree of market competition does not vary before the contract is performed. We integrate this framework with the strategies of entry deterrence and raising rivals’ costs coming from the literature of Industrial organization. We focus thus on a broader notion of transaction which considers both specific investments and competition dynamics reflected in endogenous outside options. We assume that a party’s outside option might be affected not only by her own investments (as in Hart and Moore, 1985) but also by the investments made by the contractual counterpart. Given that the outside option of an agent identifies the potential competitors of the contractual counterpart, with such endogenous outside options, a party is induced to invest strategically in order to encourage her counterpart’s competitors and/or to deter her own competitors, by raising the exit costs of the other contractual party.
The rationale for such a behaviour rests upon the circumstance that affecting parties’ outside options may alter parties’ threat point in the ex-post bargaining over surplus sharing, neutralising counterpart’s potential hold up. Under the assumption of endogenous outside options, each contractual party is thus induced to switch from the selection of ex-ante efficient investment in the attempt to lock her counterpart into the contract, reducing endogenously her ex-post contractual power.

In other words, when contracts are incomplete agents may use the outside market as a discipline device in order to sanction or prevent post-contractual opportunism. However, at the same time parties may use the outside market in order to exploit counterpart’s quasi-rent and to behave opportunistically.

The application of the outside option principle in our setting may lead to counterintuitive results: each party might be induced to select those investments that negatively affect the other party’s outside option and hence enhance their share of the final surplus in the ex-post bargaining. Moreover, this effect, which is defined here as ‘cross competition effect’, is further magnified when each party’s investments positively affect his own outside option as well (as in the standard assumption of Hart and Moore, 1990). Under this framework, parties’ investments may increase the ex-post competition between the contractual parties, reducing each party’s outside options to an extent that depends on the impact of each investment on investors’ competitors.

This ex-post effect of competition, quite neglected in the standard literature, may actually reduce, at the margin, each party’s incentive to choose the general-purpose investment, altering quite dramatically the inefficiency that the hold-up problem generates. In some circumstances, parties may even over-invest rather than under-invest. According to the impact of these investments on each party’s outside options (i.e. on counterpart’s competitors) investment decisions may result in inefficient rent dissipation, even if in some cases the negative effect of rent dissipation might be mitigated by the endogenous enforcement effect realised by the parties’ strategies over ex-post competition. The model proposed extends the framework provided by the so-called New Property Rights School, also known as GHM approach, in that it explicitly allows for outside options being affected.
by the investments made by parties. The paper thus show that the role played by property rights allocation in producing optimal incentives to invest in specific assets strictly depends on the impact exerted by investments on parties’ outside options.

Our conclusions suggest that the design of optimal ownership structure for the governance of incomplete contracts should take onto account the dynamics of market competition to preserve ex-post efficiency\(^1\).

Some other recent papers have addressed the analysis of the impact of endogenous outside options in an incomplete contract framework\(^8\). However this paper differs from previous literature since it shows the co-existence of multiple equilibria in bilateral over-investment\(^**\), both in specific and general purpose investments. Finally, the paper differs from previous literature since it points out the emergence of cross competition framework (Nicita, 2001, 2004), defined as the complex institutional order characterized by strategic

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\(^1\) The analysis of the role competition plays in affecting investment incentives in incomplete contracts has been independently pointed out in a paper by Chatterjee and Chiu (1999), who study agents’ investment decisions between general purpose and specific investments with interdependent outside options under different ownership structures. The paper by Chatterjee and Chiu is the only other paper we’re aware of in which market-contracts interactions are explicitly pointed out and investigated under the assumption of a discrete choice among different investment types (specific and general-purpose), rather than among different levels of the same investment type. Aside from the basic differences in the formulation of the models, the analysis here proposed differs in some respects. While the paper by Chatterjee and Chiu puts very interesting insights under a property rights perspective, in the model here developed, cross competition equilibria are reached regardless of asset ownership, extending thus the analysis of contractual enforcement to situation characterized by zero property rights (as in the case of transnational commons).

\(^8\) Among these, de Meza and Lockwood (1998) have formalised the role of outside and ‘inside’ options on the renegotiation game under a repeated setting. This is not the case of the model here addressed, where it is assumed a simple take-it-or leave-it choice in a one-shot game. MacLeod and Malcomson (1993) show how exogenous variations of parties’ outside options in an incomplete contract may affect the threat point of the renegotiation game, a conclusion reached also by Edlin and Hermalin (1998). A relevant implication pointed out by MacLeod and Malcomson is that, in order to have a self-enforcing contract, every exogenous change affecting parties’ outside options shall never be binding. Here, the analysis goes further by stressing the crucial strategic role played by the choice of the investment type in affecting parties’ outside options. Bolton and Whinston (1993) formalize the case where, under a seller’s monopoly, buyers downstream competition affects their incentive to invest. Although they are concerned with market-contracts interactions, their analysis is not fully developed in an incomplete contract, neither they provide an explanation of the choice between specific and general purpose investments. The overinvestment result reached in this paper has been already pointed out by Grossman and Hart (1986), Bolton and Whinston (1993) and Chung (1996).

\(^**\) Whereas Grossman and Hart (1986) analyze a case in which if a party over-invests the counterpart will under-invest and vice-versa; Bolton and Whinston are not concerned with specific versus general-purpose investments; Chung’s notion of over-investment differs from the one here proposed which identifies the extra-costs associated with the selection of a different investment type, rather than a higher level of the same investment type.
interactions between the transaction costs induced by market competition and those generated by contractual rivalry.

2. The Grossman-Hart-Moore (GHM) model

Let us assume a set of assets \( A = (a_1, a_2) \) and a set of agents \( M = (B, S) \). \( S \) (the seller), in combination with asset \( a_2 \), produces a single unit of a widget \( z \) which is acquired\(^\dagger\) as an input by \( B \) (the buyer) at the price \( P \) or by a third party at a price \( p \), with \( P > p \), determined according to parties’ contractual power. Let us assume that prior to trading, both \( B \) and \( S \) make a specific self-investment that enhances respectively the marginal revenue for \( B \) and reduces the marginal cost of production for \( S \). The marginal return to the investments depends on whether or not trade occurs between \( B \) and \( S \). When \( S \) trades with \( B \) the net total surplus generated \( W \) is given by

\[
W = R(i) - P + P - C(e) - (i + e) = R(i) - C(e) - (i + e)\]

When \( S \) or \( B \) trade with third parties, the net total surplus \( w \) is given by

\[
w = r(i) - p + p - c(e) - (i + e) = r(i) - c(e) - (i + e).\]

Let us assume\(^\ast\ast\) that there are always gains from trade between \( S \) and \( B \), that is: \( W > w > 0 \). When contracts are complete, efficient trade between \( S \) and \( B \) will always occur, with \( S \) and \( B \) choosing respectively the investment levels \( e^* \) and \( i^* \) that maximize \( W \)\(^\dagger\dagger\) and satisfy the first order conditions:

\[^{\dagger}\dagger\] Symmetrically, \( B \) can purchase the widget, either from \( S \) (specific-relationship), or from the spot market. In combination with own \( a_1 \), \( B \) uses this widget \( z \) to produce an output \( x \) that is sold on the output market.

\[^{\dagger}\] Note that, in this respect, investments are made at \( t=0 \), and the widget is supplied at \( t=1 \), that is, there is uncertainty about the type of the widget which \( B \) will require in \( t=1 \).

\[^{\dagger\dagger}\] See appendix, point 1.

\[^{\dagger\dagger\dagger}\] This condition shows the idea that investments \( i \) and \( e \) are relation-specific.
leading to an equilibrium like, for instance \(X, Q,\) or \(K\) on the Pareto frontier, determined according to parties’ ex-ante contractual power, as figure 1A shows.

When contracts are incomplete, parties will choose their investments non-cooperatively, leading to equilibrium into the second best (dotted, in figure 1B) area and the Pareto frontier is not achieved.

The main contribution of the GHM model is that of showing the relevance of property rights assignment on the degree of underinvestment in an incomplete contract framework.
The main assumption is that the ownership of physical assets matters because it increases investors’ ex-post outside options after investments are made; namely

\[ R'(i; A) > r'(i; a_i, a_2) \geq r'(i; a_i) \geq r'(i; \emptyset) \quad \forall i : 0 < i < \infty \quad \text{for the buyer} \]

\[ |C'(e; A)| > |c'(e; a_i, a_2)| \geq |c'(e; a_i)| \geq |c'(e; \emptyset)| \quad \forall e : 0 < e < \infty \quad \text{for the seller}. \]

The intuition here is that ownership is a source of power since it assigns to the owner the residual right to control over non contractible uses, even when trade occurs with third parties. The allocation of ownership over assets determines the returns to investments. As a consequence, ownership determines parties’ incentives to choose the degree of specific investments. Moreover, in GHM’s model, investors’ outside options are positively correlated with ownership. This is precisely the reason why ownership increases incentives to invest: since investor’s outside options raise with investment, it is convenient for the owner to invest in any event, independently of counterpart’s decision to maker or not cooperative specific investments. On the other hand, non-owner’s incentives to make relationship-specific investments is reduced in the above framework: since non-owner’s outside options are not affected by the investment made, there is no reason for a rational agent to invest in specific assets if she is not also the owner of the assets in which the
investment is embedded. As a consequence, the full cooperative outcome will not reached and only second best outcomes could be afforded in the above framework. Thus, in the GHM model, since the allocation of property rights on physical assets can affect the degree of under-investment, the hold-up problem is transformed into the problem of selecting the ownership structure which ensures second best outcomes, provided that every ownership structure shows both (private) benefits and (social) costs.

3. Extending the dynamics of endogenous outside options

In the GHM model, it is assumed that ownership affects investors’ outside options. In particular, it is assumed that even when trade occurs with third parties, the incentive to raise the level of specificity of investments increases with the number of assets owned by investors. That, in turn, implies that we are assuming an ex-post market structure according to which the market opportunities for owners, after investments are made, are always greater than the ex-ante competitive conditions associated to generic investments. However, it assumed that these opportunities are never so great to overcome the first best gains from trading with the original counterpart. What happens to the above framework if we extend the GHM model to allow parties to affect outside options in such a way to improve their ex-post pay-off when trading with third parties, independently of gaining access to property rights? In other words, what happens to the above framework if we assume that parties’ investments maintain the possibility to monopolize the market?

Let us assume first that the investor can sink economic resources with the purpose of monopolizing the market. That means that he will increase his own outside option while reducing counterparts’ outside options.

Let us consider the case of a buyer B (a similar result could be shown for the seller§§§) being able to select a specific investment such as to increase her valuation of contracting with third parties (as in the GHM model) while increasing the seller’s cost to trade with third parties. The net ex-post pay-off of agents will be given by:

$$\Pi_B = -p - aC(e) + ac(e, i) + aR(i) + (1 - a)r(i) - i$$

§§§ See annex
and the first order conditions become:
\[ \Pi'_b(i) = aR'(i) + (1-a)r'(i) + ac'(i) = 1 \quad (2C) \]

Thus we have the following proposition.

**Proposition 1. Countervailing effect of specific investments**

When in the above setting, buyer’s investment is such that \( c'(i) > 0 \), i.e. if \( B \)'s investment has the effect of increasing the seller’s cost of trading with third parties, thus the specific investment may have a countervailing effect on the under-investment equilibrium.

Moreover, when \( c'(i) = \left( \frac{1}{a} - 1 \right) \left[ R'(i) - r'(i) \right] \), the countervailing effect is such to produce a buyer’s marginal return equal to the buyer’s quasi-rent associated with cooperative specific investments on both sides.

**Proof.**

It is easy to show that when \( c'(i) = \left( \frac{1}{a} - 1 \right) \left[ R'(i) - r'(i) \right] \), then

\[ \Pi'_b(i) = aR'(i) + (1-a)r'(i) + a \left\{ \left( \frac{1}{a} - 1 \right) \left[ R'(i) - r'(i) \right] \right\} = 1 \Rightarrow R'(i) = 1, \]

which is the first order condition for buyer’s efficient investments.

**Proposition 2. Countervailing effect and second best outcomes**

In the above setting the countervailing effect generates a marginal return on investment for the buyer which is always higher than that associated with full ownership in the GHM model.

**Proof.**

If the countervailing effect is such that \( 0 < c'(i) \leq \left( \frac{1}{a} - 1 \right) \left[ R'(i) - r'(i) \right] \), holds, then also

\[ aR'(i) + (1-a)r'(i) < aR'(i) + (1-a)r'(i) + ac'(i) \leq R'(i) \]

is satisfied.
4. The economic meaning of endogenous outside options

What is the economic meaning of propositions 1 and 2? The intuition here is to extend further the assumption held by the GHM model in order to consider the case in which investor may sink economic resources (represented by $i$ and $e$) not only to increase their own outside options, as in the GHM model, but also to decrease counterparts’ outside options. That is the case in which by increasing the level of the investment with respect to the underinvestment level produces some effects on counterparts’ outside options.

The ex-post reduction of counterparts’ outside options can have several economic explanations. The main argument is that, since as in GHM parties’ outside options act as default point in the ex-post renegotiation game, it is rational to attempt to affect outside options in a way to increase ex-post bargaining power. While in GHM the only possibility to affect outside options is that of having access to the ownership of the assets involved in the production process, we show that another possibility is that of strategically sink economic resources with the purpose of decreasing counterparts’ outside options. One rationale for that could be found in the entry deterrence effect generated by the investor on ex-post competitors (who represent, in fact, counterpart’s outside options) as in Dixit (1980). If the investor is the buyer, in the extreme case studied by Dixit any amount of $i$ greater than the underinvestment level generates a deterrence effect on competitors so as to induce them to exit the market and/or to inhibit their entry by raising their costs to compete (Salop and Scheffman, 1983). Consequently, it would be rational for the buyer to select that amount, since this strategy will increase her ex-post gains from trade.

Between the extreme case studied by Dixit and the underinvestment equilibrium analyzed by GHM there is a range of value in which a lower degree of underinvestment increases ex-post investor’s contractual power through the increase in market power generated by the change induced in parties’ outside options.

With respect to the GHM model, here we show the interdependence between contractual rivalry and market competition by outlining the circumstances under which it would be rational for investors to affect ex-post market competition to some extent (Chatterjee and
Chiu, 1999; Nicita, 2004). Of course, when any possibility to affect ex-post competition is inhibited we turn back to the GHM model as a particular case in which ex-post competition is exogenously given. Comparing this conclusion with the literature on incomplete property rights, allows us to show an important result: access to property rights could not be a sufficient safeguard against post-contractual opportunism under any circumstance, as in the GHM context. When parties may affect market configuration through their investment choices, market dynamics may be a crucial factor in determining parties’ ex-post bargaining power. This result is twofold: on the one hand, it shows that ex-post market configuration may affect parties’ incentives to invest so that the ability to ex-post monopolize relevant markets may positively align incentives to make specific investments; on the other hand, it shows that property rights assignment may not be as crucial as parties’ ability to ex-post monopolize relevant markets under an incomplete contract framework.

5. Property rights allocation with endogenous outside options
An important issue to be pointed out is that the countervailing effect defined above does not necessarily depend on the allocation of property rights to the buyer.
In particular, when the countervailing effect is so large that proposition 1 holds even if all the assets are attributed to the seller and the set of assets owned by $B$ is empty, with $A_B = \emptyset$, the buyer will select the amount of investment that satisfies the following first order condition:

$$\Pi'_b(i; A) = aR'(i; \emptyset) + (1 - a)r'(i; \emptyset) + ac'(i; \emptyset) = 1.$$ 

One general consequence of the above argument regards the existence of strong incentives for the investing firm to monopolize the market, under an incomplete contract framework, even when it has not access to any property rights on physical assets.
Proposition 3. Countervailing effect and irrelevance of property rights assignment

When in the above setting the countervailing effect is so large that
\[ c'(e; A_s) < c'(i; A_B) \leq \left( \frac{1}{a} - 1 \right) \left[ R'(i; A_B) - r'(i; A_B) \right] \]
with \( A_s = \{ a_1, a_2 \} \) then the assignment of property rights is irrelevant for the selection of specific investments both on the side of the buyer and on the side of the seller.

Proof

If \( c'(e; A_s) < c'(i; A_B) \leq \left( \frac{1}{a} - 1 \right) \left[ R'(i; A_B) - r'(i; A_B) \right] \) with \( A_s = \{ a_1, a_2 \} \) that means that the countervailing effect is such to induce specific investment by the non-owner (the buyer) and to inhibits specific investments by the owner (the seller), as long as the impact of buyer’s investment outweighs the impact of ownership on seller’s outside option. Proposition 3 also defines, on the opposite side, the conditions under which property rights matter in inducing specific investments by the seller. That is the case in which the allocation of property rights to the seller inhibits buyer’s ability to influence the seller’s outside options, so that \( c'(i; A_B) = 0 \) with \( A_B = \emptyset \). Generally, however, it is reasonable to assume that market competition is more seriously relevant when we assume that a ‘cross-competition effect’ is as much as more concentrated is the ownership:

\[
\frac{\partial c(e_2, i_z; \mathcal{O})}{\partial i_z} \leq \frac{\partial c(e_0, i_0; a_1)}{\partial i_0} \leq \frac{\partial c(e_1, i_z; a_1, a_2)}{\partial i_z} \quad \text{in the case of the seller;}
\]

\[
\left| \frac{\partial r(i_1, e_1; \mathcal{O})}{\partial e_1} \right| \leq \left| \frac{\partial r(i_0, e_0; a_2)}{\partial e_0} \right| \leq \left| \frac{\partial r(i_2, e_2; a_1, a_2)}{\partial e_2} \right| \quad \text{in the case of the buyer.}
\]

In other words, ownership matters, under the above assumptions, when having exclusive access to given scarce assets (such as ‘essential facilities’) is crucial in order to affect parties’ outside option. Thus we have here a first puzzling result: under incomplete contracts with endogenous outside options, ownership is crucial in positively affecting
incentives to make specific investments only when it is crucial also to monopolize markets. As a consequence, from a consumers’ welfare perspective, the efficiency of proprietary integration (in terms of investors’ ex-ante incentives) needs to be compared with the inefficiency associated to market monopolization (in terms of dead weight loss). This conclusion is particularly relevant for antitrust evaluation of horizontal and vertical mergers.

6. The emergence of ‘Cross competition’ equilibria

One way of clarifying the essential features of endogenous outside options is to distinguish between two effects stemming from two dimensions of rivalry (contractual and market rivalry). The first, already tackled by the heuristic of GHM, focuses on ‘direct’ competition on own competitors; roughly speaking, in GHM model the investments (i and e) favour the market variables (respectively, r and c), and thus the relative position of agents on the market (r’ and e’). At first sight, as analyzed above, such first positive effect on market, denoted by r(i) and c(e), does not counterbalance the loss generated by contractual incompleteness, carrying the underinvestment equilibrium.

By contrast, a closer look at market mechanism reveals that a second indirect effect on market configuration can emerge. It happens when, for instance, B can also affect e’ with his investment i, and that symmetrically S can affect r’ with his investment e. Such second indirect effect relies on the idea agents act by a ‘indirect’ competition on counterparts’ competitors.

We name this second effect, denoted by r(e) and c(i), as reciprocal countervailing effects or cross competition equilibria. Therefore the FOCs become****:

\[ aR'(i) + (1-a)r'(i,e) + a \frac{\partial c(i)}{\partial i} = 1 \quad (4) \]

\[ (1-a)\|C'(e)\| + a\|e'(e,i)\| + \left\| (1-a) \frac{\partial r(e)}{\partial e} \right\| = 1 \quad (5) \]

**** See appendix point 3 for more details.
Where $\frac{\partial c(i)}{\partial i}$ and $\left| \frac{\partial r(e)}{\partial e} \right|$ describe the two countervailing effects††††, which it defines cross-competition effect. Indeed, the comparison between Eq. 2C and Eq. 4 highlights the effect of $S$’s investment $e$ on $B$’s maximization calculus.

In figure 3, the two grey areas denote the competitors or alternative counterparts for each agent.

![Diagram](image)

**The cross competition effect**

**Figure 3**

We can observe in figure 4 the cumulative process for (such instance) an increasing of $i$.

It is worth to note that, by $r(i)$ (‘direct’ competition), the higher level of investments $i$ the lower relevance of $B$’s competitors (or $S$’s alternative counterparts) and, by the countervailing effect $r(e)$, the higher relevance of $B$’s alternative counterparts (or $S$’s competitors).

†††† Note that $\frac{\partial \|c'(i)\|}{\partial i} \leq 0$ and $\frac{\partial r'(e)}{\partial e} \leq 0$. 
A cumulative process of equilibria

Figure 4

B’s and S’s market positions could be thus depicted by a double (cumulative) effect (see figure 4). Comparing (2A) with (4) and (3A) with (5) leads us to extend Proposition 1, as following.

**Proposition 4. Cross competition equilibria**

When both parties may affect outside options, cross-competition effects may counterbalance, under given assumptions, the losses associated to bilateral under-investments.

**Proof.**

It is sufficient to compare the following equilibria:

- if \((1 - a)R'(i) > (1 - a)r'(i) + a \frac{\partial c(i)}{\partial i}\) and \(a\|C'(e)\| > a\|c'(e)\| + (1 - a) \frac{\partial r(e)}{\partial e}\)

  the underinvestment level persists;

- if \((1 - a)R'(i) = (1 - a)r'(i) + a \frac{\partial c(i)}{\partial i}\) and \(a\|C'(e)\| = a\|c'(e)\| + (1 - a) \frac{\partial r(e)}{\partial e}\)

  the optimal investment level is achieved;
• if \((1-a)R'(i) < (1-a)r'(i) + a\frac{\partial c(i)}{\partial i}\) and \(a\|C'(e)\| < a\|c'(e)\| + (1-a)\frac{\partial r(e)}{\partial e}\) bilateral over-investments levels are generated.

7. Property rights assignment with endogenous outside options

Let us consider now how the assumption of endogenous outside options affect the criteria outlined by GHM in order to proceed to an optimal assignment of property rights under an incomplete contracts framework. The propositions below follow the GHM criteria.

(i) Productivity of the investment

The productivity degree denotes the impact of investments on aggregate surplus. The GHM model shows that if \(S\) ’s investment is comparatively estimable as low productivity, then it is optimal to assign to \(B\) the integrated ownership and in particular the integration, with \(A_B = \{a_1, a_2\}\).

The GHM conclusion can be reversed if, adding endogenous outside options, (relative) unproductivity of \(S\) ’s investment \(e\) is balanced by (relative) productivity of \(e\) on market dynamic with respect to \(B\) ’s investment \(i\). If it occurs, the allocation of ownership must account for the (cross) effects generated on incentives.

(ii) Independence degree of assets

Assets \(a_1\) and \(a_2\) are independent if \(r'(i; a_1, a_2) = r'(i; a_1)\) and \(c'(e; a_1, a_2) = c'(e; a_2)\). When the assets are independent, according to GHM model, it is optimal to implement partial ownership with \(A_B = \{a_1\}\) and \(A_S = \{a_2\}\).

With endogenous outside options, even when \(r'(i; a_1, a_2) = r'(i; a_1)\) and \(c'(e; a_1, a_2) = c'(e; a_2)\), if \(c'(i; a_1, a_2) > c'(i; a_1)\) and \(r'(e; a_1, a_2) = r'(e; a_2)\), that is if the ownership assignment stimulates buyer incentives to invest in order to reduce the seller’s outside option, then the integrated ownership with \(A_B = \{a_1, a_2\}\) is efficient in order to stimulate buyer’s incentives to invest. On the other hand, if the dead weight loss incurred
with buyer’s proprietary integration are larger than the benefits generated, than partial ownership or seller’s integrated ownership might better perform.

(iii) Complementarity degree of assets

Assets $a_1$ and $a_2$ are strictly complementary if either $r'(i; a_i) \equiv r'(i; \emptyset)$ or $c'(e; a_2) \equiv c'(e; \emptyset)$. In this case, according to the GHM model, it is optimal to implement the integrated ownership, respectively $A_B = \{a_1, a_2\}$ or $A_S = \{a_1, a_2\}$.

However, even if $r'(i; a_i) \equiv r'(i; \emptyset)$, it might occur that $c'(i; a_i) > c'(i; \emptyset)$ and $r'(e; a_i) \equiv r'(e; \emptyset)$, that is the integrated ownership reduces market dynamics. Again, the dead weight loss incurred with buyer’s proprietary integration are larger than the benefits generated, than partial ownership or seller’s integrated ownership might better perform.

(iv) Essentiality of human capital

$B$ ’s human capital is essential if $c'(e; a_1, a_2) \equiv c'(e; \emptyset)$ †††. In this case, according to GHM model, it is optimal to implement the integrated ownership of type $A_B = \{a_1, a_2\}$.

However, when $r'(e; a_1, a_2) > r'(e; \emptyset)$, the dead weight loss incurred with buyer’s proprietary integration are larger than the benefits generated, than partial ownership or seller’s integrated ownership might better perform.

The particular case analyzed by the GHM model is that with $r'(e; A) = c'(i; A) = 0$. In fact, the GHM solution holds unequivocally only when the impact of investments on

††† Note that:

a) the assumption of essentiality of human capital is the sum combination of two assumptions:
   - Complementarity of assets: $c'(e; a_2) \equiv c'(e; \emptyset)$
   - Independency of assets: $c'(e; a_1, a_2) \equiv c'(e; a_2)$

b) this is the same result of situation with $S$’s null productivity investment.

c) if both human capitals are essential then every ownership structure is efficient.
counterpart’s outside option is zero.

8. Conclusions

Since the seminal works by Williamson (1985) and by Grossman and Hart (1986) and Hart and Moore (1990), a large number of papers deal with the problem of property rights arrangements in an incomplete contract framework. In these models, since relationship-specific human capital investments increase the marginal return of the physical assets involved, investor’s outside option is affected by the investment selected. However, a crucial assumption in most of these models is that a party’s outside option (i.e. counterpart’s competitors) is not affected by the investment made by the other party, i.e. that ex-post competitors are not affected by the actions (investments) by parties.

The paper studied a two stage incomplete contract between a buyer and a seller, with specific investments and endogenous outside options. We have assumed that a party’s outside option is affected by the investment made by the other contractual party. Given that the outside option of an agent identifies the potential competitors of the contractual counterpart, with such endogenous outside options, a party is induced to invest strategically in order to encourage counterpart’s competitors and/or to deter own competitors, by raising the exit costs of the other contractual party.

The model proposed extends the framework provided by the so-called New Property Rights School, also known as GHM approach, in that it explicitly allows for outside options being affected by the investments made by parties. The paper thus shows that the role played by property rights allocation in producing optimal incentives to invest in specific assets strictly depends on the impact exerted by investments on parties’ outside options.

The main results of the paper are as follows. First, depending on the degree of ex-post market competition, (i) contractors may have strong incentives to make a over-investment (specific or general purpose) even when they have no access to property rights; (ii) over-investment may act as an endogenous enforcement device.

With endogenous outside options the parties’ strategic interdependence could be influenced
by the parties’ ability to use ex-post market competition as a discipline device in an incomplete contract. This complexity calls for a broader notion of transaction in which the notion of enforcement costs should also integrate the wide range of competition costs which parties may sustain in order to improve their market position against competitors and actual and potential counterparts. A clear definition of a complex transaction may be found in Commons’ (1924) idea that: “the choice of opportunities is always a choice between the two best accessible options at the moment of choice, and if there is no possible alternative, then the exchange may be that of “hold-up” character […] in which there is no real freedom of choice […]. Thus there is a gradation of alternatives taken into account by each party to a transaction, and consequently, from the standpoint of the motives affecting the parties, the minimum number of persons necessary to constitute a transaction is four parties, two buyers and two sellers, namely, the actual buyer and seller, and the next best alternative for each”.

While the GHM approach emphasizes the efficient role played by property rights allocation in inducing at least one party to make efficient investment, we have shown how the optimality feature of rights’ assignments strictly depends on the ex-post variation of parties outside options. With endogenous outside options owners and non-owners may over-invest independently of any initial ownership structure.

We may conclude that the with endogenous outside options, in order to proceed to an optimal allocation of property rights (also in terms of reduced dissipation induced by over-investments) we should also consider the relevance of bilateral perspective changes under any ownership structure, thus comparing, in our example the variation induced on the two outside options components:

$$\left[ a \frac{\partial c(i_j, e_j; A_j)}{\partial i_j} \right] + \left[ (1 - a) \frac{\partial r(i_j, e_j; A_j)}{\partial e_j} \right]$$

Where \( A_j \in [0; 1; 2] \) represents the ownership structure.

Our results shed light over the efficiency induced by alternative property rights allocation in a context of endogenous outside options. We show how the characteristics of
productivity’s degree of investments, independency’s degree of assets, complementarity’s degree of assets, essentiality of human capital, represent sufficient conditions – in order to estimate the choice of ownership structure – only in a world without outside options or with fixed outside options. Our conclusions suggest that the design of optimal ownership structure for the governance of incomplete contracts should take onto account the dynamics of market competition to preserve ex-post efficiency. In particular our conclusions might be of some relevance for the design of privatization policies, in the antitrust evaluation of horizontal and vertical mergers, and for the assessment of defining mandatory access to share an essential facility.
APPENDIX - PROOFS

POINT 1 In a world with contractual completeness, the investment levels $i$ and $e$, considering the net present value of the trading relationship $S = \{R(i,a) - C(e,a) - i - e\}$, are given by the first order conditions:

$$\begin{align*}
\frac{\partial S}{\partial i} &= 0 \quad \text{and} \quad \frac{\partial S}{\partial e} = 0 \\
\text{or} \quad \frac{\partial R(i,a)}{\partial i} - 1 &= R'(i^*,a_i) - 1 = 0 \quad \text{and} \quad - \frac{\partial C(e,a)}{\partial e} - 1 = -C'(e^*,a_e) - 1 = 0
\end{align*}$$

And in other terms the optimal value $i^*$ and $e^*$:

$$\begin{align*}
R'(i^*;a_i) &= 1 \\
\text{and} \quad \|C'(e^*,a_e)\| &= 1
\end{align*}$$

POINT 2 We can calculate the quasi-rent (QR) of the investments in a world with contractual incompleteness:

- $B(QR) = [R(i) - P] - i - \{r(i) - p\} - i = R(i) - P - [r(i) - p] > 0$
- $S(QR) = [P - C(e)] - e - \{p - c(e)\} - e = [P - C(e)] - [p - c(e)] > 0$

By ex-post Nash bargaining we obtain the ex-post payoffs.

$$\begin{align*}
B(\Pi) &= R - P = r - p + a[R - C - (r - c)] = -p - aC + ac + aR + (1-a)r \\
S(\Pi) &= P - C(e) = p - c + (1-a)[(R - C) - (r - c)] = p - ac + (1-a)R - (1-a)C - (1-a)r
\end{align*}$$

Then, the net ex-post payoffs

$$\begin{align*}
B(\Pi) - i &= -p - aC + ac(e) + aR + (1-a)r(i) - i \\
S(\Pi) - e &= p - ac(e) + (1-a)R - (1-a)C - (1-a)r(i) - e
\end{align*}$$

Differentiating the former net payoff with respect to $i$ and the latter with respect to $e$ yields the following necessary and sufficient conditions:

$$\begin{align*}
aR'(i) + (1-a)r'(i) &= 1 \\
(1-a)\|C'(e)\| + a\|c'(e)\| &= 1
\end{align*}$$
**POINT 3** By (6) and (7) if it is added the outside options, we obtain:

\[ B(\Pi) + i = -p - aC(e) + ac(e; i) + aR(i) + (1 - a)r(i; e) - i \]

\[ S(\Pi) - e = p - ac(e; i) + (1 - a)R(i) - (1 - a)C(e) - (1 - a)r(i, e) - e \]

Differentiating the former net payoff over \( i \) and the latter with respect to \( e \) yields the following necessary conditions:

\[ aR'(i) + (1 - a)r'(i, e) + a \frac{\partial c(e, i)}{\partial i} = 1 \]

\[ (1 - a)\|C'(e)\| + a\|c'(e, i)\| + (1 - a)\frac{\partial r(i, e)}{\partial e} = 1 \]
References


