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ABSTRACT

Bargaining position, bargaining power, and the property rights approach

In the property rights approach to the theory of the firm (Hart, 1995), parties bargain about whether or not to collaborate after non-contractible investments have been made. Most contributions apply the regular Nash bargaining solution. We explore the implications of using the generalized Nash bargaining solution. A prominent finding regarding the suboptimality of joint ownership turns out to be robust. However, in contrast to the standard property rights model, it may well be optimal to give ownership to a party whose investments are less productive, provided that this party's ex-post bargaining power is relatively small.

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Keywords: bargaining, incomplete contracts, investment incentives and ownership

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1 Introduction

The property rights approach (Grossman and Hart, 1986; Hart and Moore, 1990; Hart, 1995) is a cornerstone of the modern theory of the firm.[1] When contracts are incomplete, a party's incentives to make relationship-specific investments depend on the fraction of the investments' returns that the party will be able to capture in future negotiations. Ownership over physical assets matters, because ownership improves a party's position in future negotiations.

Specifically, consider two parties, A and B, who can make non-contractible investments in their human capital at date 1. At date 2, they can generate a surplus using physical assets. At date 0, the parties agree on an ownership structure over the assets, which determines the parties' payoffs if they fail to collaborate at date 2. Central results of the property rights approach are that (i) joint ownership is suboptimal and (ii) the party whose investments are more productive should be the owner.

In most contributions to the property rights approach, the date-2 negotiations are modeled using the regular Nash bargaining solution. Hence, while a party's *bargaining position* (i.e., its disagreement payoff) depends on the ownership structure, it is assumed that both parties have the same ex-post *bargaining power*. In the present paper, we instead apply the generalized Nash bargaining solution in order to explore how the implications regarding optimal asset ownership change if the parties' ex-post bargaining powers may differ.

It turns out that the insight that joint ownership can never be optimal is robust. However, if party A has more ex-post bargaining power than party B, then it may well be optimal to make party B owner of the physical assets, even when party A's investments are more productive. Hence, one of the most

[1] See Segal and Whinston (2010) for a recent literature review.

prominent implications of the property rights approach can be overturned.

2 Bargaining position and bargaining power

In the literature on the property rights approach, there is sometimes some confusion about how ownership influences investment incentives.[2] In general, a party's date-2 payoff depends on two aspects. First, a party's *bargaining position* is determined by the disagreement payoffs (which depend on the ownership structure). Second, a party's ex-post *bargaining power* is given by the share of the renegotiation surplus that it can capture (where the renegotiation surplus is defined as the total surplus in the case of collaboration minus the total surplus in the case of disagreement). A central assumption of the property rights approach is that the bargaining power is independent of the ownership structure (see Hart, 1995, footnote 17).

In many models it is for simplicity assumed that both parties have the same bargaining power $\pi = 1/2$ (see Hart, 1995). However, a growing number of papers allows for any bargaining power $\pi \in [0, 1]$, see e.g. Farrell and Gibbons (1995), Nöldeke and Schmidt (1998), Schmitz (2006), Antràs and Staiger (2008), Ohlendorf (2009), Hoppe and Schmitz (2010), Ganglmair et al. (2012), or Schmitz (2013). These papers are focused on different problems (e.g., private information, sequential investments, public goods, or applications to international trade, privatization, or law and economics), but do not explore

[2] See e.g. Farrell and Gibbons (1995, p. 315), who point out that investment incentives are increasing in a party's ex-post bargaining power, which (as they point out in their footnote 4) they incorrectly attributed to Grossman and Hart (1986) in an earlier version of their paper. Indeed, in Grossman and Hart (1986) the ex post bargaining power is always 1/2, while ownership improves investment incentives because it influences the disagreement payoffs.

the implications of different bargaining powers for the central findings in the basic property rights setting as outlined by Hart (1995).

A simple non-cooperative bargaining game that leads to the generalized Nash bargaining solution assumes that one party can make a take-it-or-leave-it offer with probability π, while the other party can make the offer with probability $1-\pi$ (see the appendix of Hart and Moore, 1999). If one models the bargaining process following Rubinstein's (1982) alternating-offers game, then the bargaining power π can be derived endogenously depending on the parties' relative time preferences.[3]

The present contribution is also related to the work by De Meza and Lockwood (1998) and Chiu (1998), who find that sometimes an agent with an important investment decision should not own the assets he works with. However, these authors apply the outside-option principle to model the date-2 negotiations; i.e., they replace the split-the-difference rule by the deal-me-out solution.[4]

[3] In particular, a party has a larger bargaining power when it is relatively more patient. If a party does not accept an offer and instead wants to make a counteroffer, then it must incur the cost of waiting. The smaller the party's discount rate, the smaller is this cost. Thus, being more patient confers greater bargaining power. See Muthoo (1999) for an excellent textbook exposition.

[4] According to the deal-me-out solution, the parties split the *total* date-2 surplus 50:50 if each party gets at least its default payoff (otherwise, a party that would get less than its default payoff gets its default payoff, while the other party gets the residuum). In contrast, we follow the standard property rights approach and assume that at date 2 the parties divide the renegotiation surplus (i.e., the difference between the total surplus given collaboration and given disagreement). In the case of alternating-offers bargaining, we thus assume that the default payoffs are inside options, while De Meza and Lockwood (1998) and Chiu (1998) consider outside options (see Muthoo, 1999).

3 The model

There are two parties, A and B. For example, party B might be the supplier of an intermediate good, which party A can use to produce a final good. At some initial date 0, the parties agree on an ownership structure $o \in \{A, B, J\}$. In the example, the owner has the control rights over the physical assets needed to produce the intermediate good. Thus, A-ownership can be interpreted as integration and B-ownership as non-integration, while $o = J$ means that there is joint ownership. In line with the property rights approach (see Hart, 1995), we assume that the two parties will agree on the ownership structure that maximizes their anticipated total surplus, which they can divide up-front by suitable lump-sum payments.[5]

At date 1, parties A and B simultaneously make relationship-specific investments $a \geq 0$ and $b \geq 0$, respectively, which are observable but not contractible. The investments are made in the parties' human capital; i.e., party A's investment improves its ability to produce the final good, while party B's investment improves its ability to produce the intermediate good. Let the parties' investment costs be given by $c(a) = \frac{1}{2}a^2$ and $c(b) = \frac{1}{2}b^2$.

At date 2, the parties bargain about whether or not to collaborate.[6] If the parties agree to collaborate, then they together generate the date-2 surplus $a + \xi b$. The technology parameter ξ indicates whether party A's investments are more productive ($0 < \xi < 1$) or whether party B's investments are more

[5] Since ex-ante bargaining determines only the division of the anticipated surplus, but not its size, there is no need to specify the ex-ante bargaining powers of the two parties (which in general may differ from their ex-post bargaining powers).

[6] Note that by assumption ex-ante it is not possible for the parties to commit to collaborate ex-post. See Hart and Moore (1999) and Maskin and Tirole (1999) for discussions of the incomplete contracting paradigm.

productive ($\xi > 1$).

Remark 1 *In a first-best world, the parties would collaborate ex-post and the total surplus would be given by* $S = a + \xi b - c(a) - c(b)$. *Hence, the first-best investment levels are* $a^{FB} = 1$ *and* $b^{FB} = \xi$. *Note that the party whose investments are more productive invests more.*

In the incomplete contracting world, if the parties do not collaborate at date 2, their payoffs depend on the ownership structure as shown in Table 1. Specifically, if there is A-ownership, then in the case of disagreement party A (who controls the physical assets) can produce the intermediate good without party B. However, in this case party A can make the profit εa only, where $\varepsilon > 0$, while party B makes zero profit. Note that party A cannot make use of party B's investments, which were made in party B's human capital. Moreover, as party A's investments are relationship-specific, it is assumed that $\varepsilon < 1$, so that the returns of party A's investments are smaller in the absence of party B's human capital. Analogously, if there is B-ownership and disagreement, then party B (who controls the assets) can make the profit $\varepsilon\xi b$ by trading with someone else, while party A makes zero profit. Finally, in case of joint ownership each party has veto power over the use of the assets, so that both parties' disagreement payoffs are zero (cf. Hart, 1995).

	party A	party B
$o = A$	εa	0
$o = B$	0	$\varepsilon\xi b$
$o = J$	0	0

Table 1. The parties' disagreement payoffs at date 2.

We model the outcome of the date-2 negotiations using the generalized Nash bargaining solution, where $\pi \in [0,1]$ denotes party A's bargaining power. Hence, the parties will always collaborate and they agree on a transfer payment such that at date 2 each party gets its disagreement payoff plus a share of the renegotiation surplus (i.e., the additional surplus that is generated by collaboration). The shares are determined by the parties' bargaining powers. Thus, in the case of integration ($o = A$), party A's date-2 payoff is given by

$$u_A^A(a,b) = \varepsilon a + \pi[a + \xi b - \varepsilon a]$$

and party B's date-2 payoff reads

$$u_B^A(a,b) = (1-\pi)[a + \xi b - \varepsilon a].$$

Analogously, in the case of non-integration ($o = B$), party A's date 2-payoff is

$$u_A^B(a,b) = \pi[a + \xi b - \varepsilon \xi b]$$

and party B's date-2 payoff is

$$u_B^B(a,b) = \varepsilon \xi b + (1-\pi)[a + \xi b - \varepsilon \xi b].$$

Under joint ownership ($o = J$), the parties' date-2 payoffs are given by

$$u_A^J(a,b) = \pi[a + \xi b]$$

and

$$u_B^J(a,b) = (1-\pi)[a + \xi b].$$

We can now analyze the parties' investment incentives. Given ownership structure $o \in \{A, B, J\}$, at date 1 party A chooses the investment level

$$a^o = \arg\max\{u_A^o(a,b) - c(a)\}$$

and party B chooses the investment level

$$b^o = \arg\max\{u_B^o(a,b) - c(b)\}.$$

Thus, under A-ownership, the investment levels are given by $a^A = \pi + (1-\pi)\varepsilon$ and $b^A = (1-\pi)\xi$. Under B-ownership, the investment levels are $a^B = \pi$ and $b^B = \pi\varepsilon\xi + (1-\pi)\xi$. Under joint ownership, the investment levels are $a^J = \pi$ and $b^J = (1-\pi)\xi$. Note that party A's (party B's) investment incentives are increasing (decreasing) in party A's ex-post bargaining power π.

Lemma 1 *The investment levels can be ranked as follows:* $a^J = a^B \leq a^A \leq a^{FB}$ *and* $b^J = b^A \leq b^B \leq b^{FB}$.

At date 0, the parties agree on the ownership structure $o \in \{A, B, J\}$ that maximizes the total surplus $S^o = a^o + \xi b^o - c(a^o) - c(b^o)$. We can thus state our main findings as follows.

Proposition 1 *(i) Joint ownership can never be strictly optimal.*

(ii) If $\pi = 1/2$*, then the party whose investment is more productive should be the owner. Hence, it is optimal to choose* $o = A$ *if* $\xi < 1$ *and* $o = B$ *if* $\xi > 1$.

(iii) For any given technological (dis-)advantage ξ *of party* B*, the ownership structure* $o = A$ *is optimal if party* A*'s bargaining power* π *is sufficiently small, while* $o = B$ *is optimal if party* A*'s bargaining power is sufficiently large.*

Proof. (i) Note that the total surplus is concave and there is always underinvestment with regard to the first-best benchmark. Hence, joint ownership can never be strictly better than ownership by party A (or by party B), since party A (party B) invests more in the case of $o = A$ ($o = B$) than in the case of joint ownership, while the non-owner's investment under $o = A$ and $o = B$ is the same as under joint ownership.

(ii) If $\pi = 1/2$, then $S^A - S^B = \varepsilon(2-\varepsilon)\left(1-\xi^2\right)/8$, which is strictly positive if $\xi < 1$ and strictly negative if $\xi > 1$.

(iii) Note that S^o is continuous in π. If π goes to 0, then S^A goes to $\xi^2/2 + \varepsilon(1-\varepsilon/2)$, while S^B goes to $\xi^2/2$. Hence, regardless of ξ, ownership by party A is optimal if π is sufficiently small. Moreover, if π goes to 1, then S^A goes to $1/2$, while S^B goes to $1/2 + \varepsilon\xi^2(1-\varepsilon/2)$. Thus, ownership by party B is optimal if π is sufficiently large. ■

A well-known finding of the property rights approach is that joint ownership is suboptimal when investments are in human capital.[7] Proposition 1(i) shows that this result is robust when we allow the parties' bargaining powers to be different from 1/2. Proposition 1(ii) replicates one of the most prominent findings of the property rights approach, according to which the party whose investments are more productive should be the owner. However, Proposition 1(iii) shows that this finding crucially relies on the assumption that both parties have equal bargaining powers. In general, if the bargaining powers of the parties may differ, then it may well be optimal to give ownership to a party whose investment is less productive, if this party has a relatively weak bargaining power.

Intuitively, if a party has a very strong ex-post bargaining power and we want to give both parties sufficient incentives to invest, then it makes sense to give ownership to the other party to improve that party's bargaining position.

As an illustration, see Figures 1 and 2 (where $\varepsilon = 0.5$). Figure 1 shows the total surplus levels when party A's investment is more productive ($\xi = 0.6$). Yet, note that if party A's bargaining power π is sufficiently large (i.e., $\pi > 0.625$), then B-ownership is optimal. Figure 2 analogously depicts the case in

[7] However, it has been shown that joint ownership can be optimal in a repeated game setting (Halonen, 2002) or in the presence of asymmetric information (Schmitz, 2008).

which party B's investment is more productive ($\xi = 1.6$). Nevertheless, if party A's bargaining power is sufficiently small (i.e., $\pi < 0.384$), then A-ownership is optimal.[8]

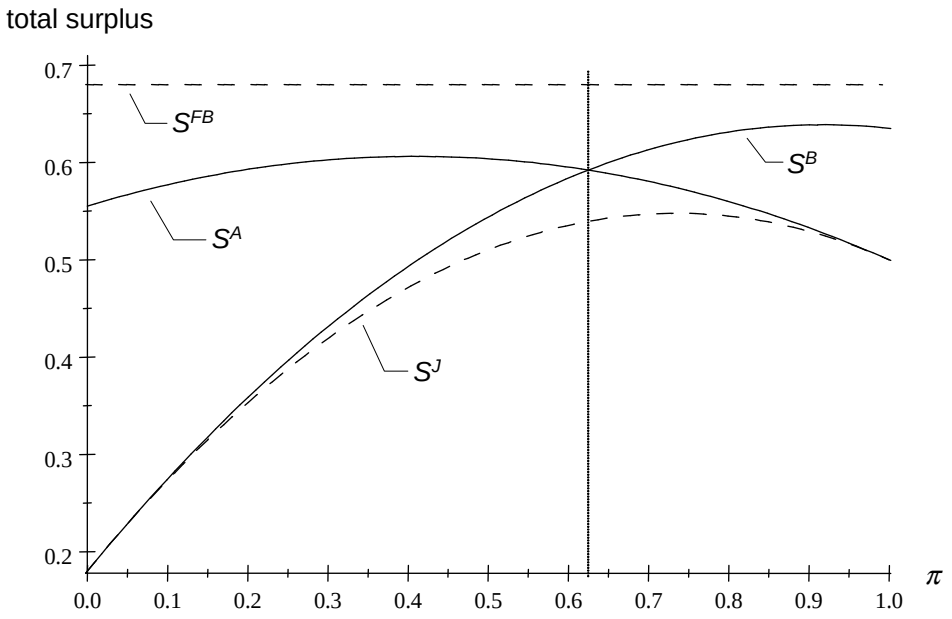

Figure 1. The total surplus levels as functions of party A's bargaining power π when party A's investment is more productive ($\xi < 1$).

[8]Observe that if party A (party B) has all the bargaining power, then joint ownership leads to the same total surplus as ownership by party A (party B). It should also be noted that if party A (party B) has all the bargaining power and $\varepsilon = 1$, then the first-best surplus S^{FB} would be attained under ownership by party B (party A).

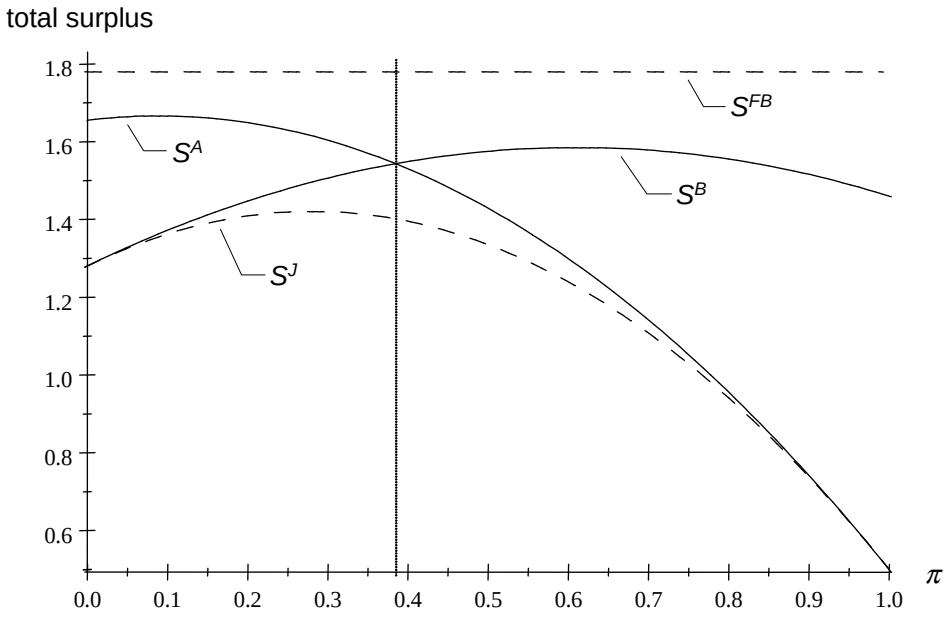

Figure 2. The total surplus levels as functions of party A's bargaining power π when party B's investment is more productive ($\xi > 1$).

4 Conclusion

In the property rights approach to the theory of the firm based on incomplete contracting, parties bargain about whether or not to collaborate after non-contractible investments have been made. Most contributions to this literature apply the regular Nash bargaining solution. We explore the implications of instead using the generalized Nash bargaining solution.

The prominent finding of the property rights literature regarding the sub-optimality of joint ownership turns out to be robust. However, in contrast to the standard property rights model, it may well be optimal to give ownership to a party whose investments are *less* productive, provided that this party's ex-post bargaining power is relatively small.

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