An Analysis of Shareholder Agreements

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Abstract

Shareholder agreements govern the relations among shareholders in privately-held firms, such as joint ventures or venture capital-backed firms. We provide an explanation for the use of put and call options, pre-emption rights, drag-along rights, demand rights, tag-along rights, and catch-up clauses in shareholder agreements. We view these clauses as serving (1) to preserve the parties’ incentives to make ex ante investments, (2) to minimize the parties’ incentives to engage in value-destroying ex post transfers, and (3) to achieve the efficient allocation of ex post ownership in the venture. We extend our framework to discuss the use of other clauses, such as the option to extend the life of a business alliance. (JEL: G34).

Keywords: Shareholder Agreements; Put Options; Call Options; Pre-emption Rights; Drag-along Rights; Demand Rights; Tag-along Rights; Catch-up Clauses.
1 Introduction

Shareholder agreements specify the rights and duties of shareholders when those prescribed by law and regulation are thought not to be appropriate. Shareholder agreements are used mostly by companies with at least some shareholders actively involved in the management of the company. Prominent examples of shareholder agreements are the joint venture and venture capital contracts that govern joint ventures and venture capital-backed firms, respectively.¹

Shareholder agreements generally grant the parties the following rights: the option to put their stakes to their partners or to call their partners’ stakes, in part or in whole, at a strike price that is typically equal to ‘fair’ value; pre-emption rights that confer precedence to the parties in buying their partners’ stakes at ‘fair’ value in case the partners should wish to exit the venture; catch-up clauses that maintain the parties’ claims to part of the payoff from a trade sale or an IPO when the parties have ceded their stakes to their partners following the partners’ exercise of a call option; drag-along rights that allow the parties to force their partners to join them in selling their stakes to a trade buyer in the case of a trade sale; demand rights that allow the parties to force their partners to agree to taking the venture public in an IPO; and tag-along rights (or piggy-back rights, or co-sale agreements) that allow the parties to demand of a trade buyer buying their partners’ stakes the same treatment as received by their partners.

We view the preceding clauses as serving (1) to preserve the parties’ incentives to make ex ante investments, (2) to minimize the parties’ incentives to engage in value-destroying ex post transfers, and (3) to achieve the efficient allocation of ex post ownership in the venture. In the absence of these clauses, the desire to alter the parties’ stakes in the venture in order to minimize the value destroyed by transfers from the venture or the opportunity to sell the venture to a trade buyer or to take the venture public in an IPO may give rise to renegotiation. Ex post renegotiation — even if costless and efficient — will generally alter the parties’ shares of the payoff, thereby distorting the parties’ ex ante investments.

¹Standard shareholder agreements are described in Bernstein (1988), Freedman (1994), Martel (1991), and Stedman and Jones (1990). Joint venture contracts are described in Herzfeld and Wilson (1996), Linklaters et al. (1990), and Scott (1999); and venture capital contracts in Bartlett (1994) and Stedman and Jones (1990). Contracts appear to be strikingly similar across countries and legal systems (Martel, 1991). See Appendix 1 for a brief description of the clauses most commonly found in shareholder agreements.
We show that put and call options maintain the parties' shares of the payoff when the parties' stakes in the venture must be altered in order to minimize the value destroyed by transfers from the venture. Pre-emption rights and tag-along rights deny the parties the ability to increase their share of the payoff by threatening the sale of their stake to a trade buyer who would decrease the value of the venture, or the incentive to conspire with a trade buyer who would increase the value of the venture to exclude their partners from sharing in that increase in value. Drag-along rights (respectively, demand rights) deny the parties the ability to increase their share of the payoff by threatening to veto or refusing to take part in a value-increasing sale to a trade buyer (respectively, IPO). Catch-up clauses deny the parties holding a call option the ability to profit from exercising their call prior to a trade sale or an IPO.

Our results recall those obtained in the literature on the hold-up problem (Williamson, 1985; Grossman and Hart, 1986; Hart and Moore, 1988, 1990). A hold-up problem exists in a joint venture to the extent that the making of an investment that is specific to the venture makes the parties to the venture vulnerable to opportunism on the part of their partners in the venture. As noted by Chung (1991) and Aghion, Dewatripont and Rey (1994), the hold-up problem can be solved under the assumption that a contract can be written that grants all bargaining power to one party and imposes a specific trade in case of failure on the part of the parties to come to an agreement in renegotiation. Nöldeke and Schmidt (1995) show that options implement that contract. The main insight of our paper is that the various clauses in shareholder agreements can each be viewed as an option. The option is explicit in the case of the put and call options, and implicit in the case of the remaining clauses. In particular, tag-along rights are a form of put option, whereby a party can put his stake to a trade buyer. Pre-emption rights, catch-up clauses, drag-along rights, and demand rights are forms of call options, whereby a party can call his partners’ stakes.

What makes the implicit options unique is that they are state-dependent. Thus, pre-emption rights can be used only in the case of the projected sale of the venture to a trade buyer, tag-along rights and drag-along rights can be used only in the case of an actual sale to a trade buyer, and demand rights can be used only as part of the taking public of the venture. The state-dependency of some options extends to their strike price. It is determined by the offer made by the trade buyer.

\[^2\]Nöldeke and Schmidt (1998) show that options can induce efficient investment when investment is made sequentially.
in the case of tag-along rights and drag-along rights, and by the investment bank setting the IPO price in the case of demand rights.

The state-dependency of the options is important, for it avoids the simultaneous exercise of conflicting options and confines the optionholder’s ability to exploit the strong bargaining power conferred by the option to the state in which the option can be exercised. This is in contrast to the state-independent bargaining power conferred by majority ownership.


We proceed as follows. We present the initial setting and analyze the case in which the parties can commit to maintaining the shares of the payoff in Section 2. We then proceed to show how the various clauses we consider can maintain the parties’ shares absent such commitment. We analyze the case where the venture must remain the property of one or both founding parties in Section 3 and that where it must be sold to a trade buyer or taken public in an IPO in Section 4. We discuss

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3 Gomes and Novaes (2001) focus on the role played by shareholder agreements in mitigating the overinvestment problem through shared control.

4 Using keywords such as “drag-along rights” and “tag-along rights,” a search with Econlit in December 2002 yielded no results in the economics literature.
continuation and termination in alliances in Section 5. Section 6 discusses some further issues. Section 7 concludes by discussing the similarities and differences between shareholder agreements and the rules and regulations that govern tender offers and the sale of control blocks. Appendix 1 contains a brief overview of the clauses found in standard shareholder agreements. Appendix 2 contains most proofs.

2 The initial setting

Two parties \(a\) and \(b\) jointly undertake a venture.

Each party must make an investment towards the success of the venture. Let \(i_i\) denote the investment made by party \(i\) at a cost \(\frac{1}{2}c_i^2\), \(i \in \{a, b\}\).

Once undertaken, the venture can be put to one of two uses. It can remain a joint enterprise, or it can be acquired in whole or in part by a trade buyer \(tb\) in a trade sale.\(^5\) We denote \(u\) the use to which the venture is put, \(u \in \{ab, tb\}\).

The value of the venture in use \(u\) is \(V_u(\min[i_a, i_b], t_i + t_j, s)\). In addition to being affected by the ex ante investments \(i_a\) and \(i_b\), the value of the venture is also affected by the ex post transfers \(t_i\) and \(t_j\) in which the parties to the venture may engage, and by the state of the world \(s\). We denote \(p_s\) the probability of state \(s\).

Any party to the venture, whether a founding party or a trade buyer who has acquired the stake of a founding party, may engage in a transfer. Thus, \(i, j \in \{a, b, tb\}\). The personal benefit to party \(i\) of engaging in a transfer \(t_i\) is \(B_i(t_i) \equiv \alpha_iB(t_i)\), with \(\alpha_i \geq 0\) an index of the relative importance of \(i\)’s personal benefit. In our setting, transfers provide the impetus for much of the renegotiation that would occur in the absence of the clauses we consider.

The transfers we have in mind are not so much outright theft or “tunneling” (Johnson, La Porta, Lopez de Silanes, and Shleifer, 2000) from the venture as the ability of the parties to make use of the knowhow gained in the venture for purposes that may compete with the venture. For example,

\(^5\) The venture can also be acquired by one or the other founding party in its entirety, or it can be taken public in an IPO. The first two outcomes can be viewed as very similar to the case in which the venture remains under joint ownership, but the parties’ stakes are modified (see Section 3.1). The third outcome can be viewed as very similar to a trade sale (see Section 4.1).
a venture capitalist may transfer the technical knowhow gained from one startup to a competing startup when both startups are part of the venture capitalist’s portfolio, and a party to a joint venture may use the knowhow acquired from its partner in the joint venture to compete directly with the partner. Such transfers are considered to be of primary importance by students of joint ventures for example.6 Unlike theft or tunneling, such transfers can be engaged in by both parties to the venture, rather than by the majority partner alone.7

We consider two states: the state $s_{tb}$, in which a trade buyer who can increase the value of the venture offers to buy the venture, and the state $s_{ab}$ in which there is no such trade buyer and the venture should therefore remain the joint property of the founding parties $a$ and $b$. We leave open the possibility that a trade buyer who cannot increase the value of the venture exists in state $s_{ab}$. In either case, we assume that a trade buyer has no bargaining power when bargaining with one or both founding parties.

The formulation we have chosen deserves some explanation. We have chosen to use the Leontieff production function $I \equiv \min \{i_a, i_b\}$ because it has the property that the first-best investments can be induced even under joint ownership (Holmström, 1982; Legros and Matthews, 1993; Hauswald and Hege, 2002). This allows us to concentrate on renegotiation as the single cause of the departure from efficiency, and on the role of the clauses we discuss in avoiding such departure. We have chosen to use the additive formulation $T \equiv t_i + t_j$ for transfers because it allows us to concentrate on the combination of the parties’ stakes in the venture and their indices $\alpha_i, i \in \{a, b, tb\}$, as the single cause of the parties’ possibly differing incentives to engage in transfers.8

We make the following assumptions: $V_{u,1} > 0, V_{u,11} < 0, V_{u,2} < 0, V_{u,22} < 0, V_{u,12} < 0, B' > 0$, and $B'' = \text{cst} < 0$. These assumptions imply that the value of the venture is increasing and concave in investment, that it is decreasing and concave in transfers, that transfers decrease investment, and that the personal benefits to transfers are increasing and concave in transfers. The assumption that $B''$ is constant simplifies the comparative statics analysis.

We also assume that $V_{u,2} (I, 0, s) + B'(0) < 0$. This implies that no transfer takes place when the

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6 See for example Reich and Mankin (1986) and Doz and Hamel (1998).
7 See Hauswald and Hege (2002) for an analysis of the case where only the majority partner can engage in transfers.
8 We note that our main results do not depend on the specific formulation we have chosen. For these results to hold, we simply need the possibility that the parties’ ultimate shares of the final payoff can be made to differ from the original shares.
venture has a single owner. A party owning only part of the venture may, however, wish to engage in a transfer. This is because the cost of the transfer is shared with the other party in proportion to each party’s stake, whereas the benefit of the transfer is received in its entirety by the party engaging in the transfer. We assume that transfers do occur when the venture has more than a single owner.

Our purpose in the present section is to show that the first-best investments can be induced even under joint ownership when the parties can commit to maintaining the shares of the final payoff in their original proportions. In the remaining sections, we shall show how the various clauses we consider can maintain the parties’ shares absent such commitment.

In the spirit of backward induction, we initially consider the ex post stakes \( \gamma^r \), \( 0 < \gamma^r < 1 \), and \( 1 - \gamma^r \) that the parties \( a \) and \( b \) will choose for the purpose of minimizing the value destroyed by transfers in the state \( s_{ab} \) in which the venture remains the joint property of the parties.

**Proposition 1** Following the making of the investments \( i_a \) and \( i_b \) and the realization of the state \( s_{ab} \), the stake \( \gamma^r \) that maximizes the value of the venture is

\[
\gamma^r = \frac{V_{ab,22}(I, T^r, s_{ab}) + \alpha_b B''}{V_{ab,22}(I, T^r, s_{ab}) + \alpha_a B'' + V_{ab,22}(I, T^r, s_{ab}) + \alpha_b B''}
\]

where \( T^r = t^r_a + t^r_b \) with \( t^r_a \equiv \arg \max \gamma^r V_{ab}(\tilde{I}_a, t^r_a, s_{ab}) + \alpha_a B(\tilde{I}_a) \) and \( t^r_b \) similarly defined.

Proof: See Appendix 2.

Proposition 1 implies that \( \gamma^r \leq \frac{1}{2} \) as \( \alpha_a \geq \alpha_b \). The intuition for this result is that \( \alpha_a > \alpha_b \) for example implies that transfers by party \( a \) are less destructive of value than those by party \( b \). The total level of transfers should therefore comprise proportionately more transfers by \( a \) than by \( b \). This is achieved by setting \( \gamma^r < \frac{1}{2} \), thereby having \( a \) bear a smaller part of the costs of the transfers than does \( b \).

We now consider the first best investments \( i_a^{FB} \) and \( i_b^{FB} \). These are the solution to the problem

\[
\max_{\tilde{I}, i_a, i_b} \left[ V_{ab}(\tilde{I}, T^r, s_{ab}) + \alpha_a B(t^r_a) + \alpha_b B(t^r_b) \right] + p_{ab} V_{ab}(\tilde{I}, 0, s_{ab}) - \frac{1}{2} \tilde{i}_a^2 - \frac{1}{2} \tilde{i}_b^2
\]

(1)

where \( \tilde{I} \equiv \min[\tilde{i}_a, \tilde{i}_b] \).

9 The first-best nature of the investments should be understood as being defined for a given level of transfer. This is because the first-best investments \( i_a^{FB} \) and \( i_b^{FB} \) are distorted by the non-zero level of transfer \( T^r \) in state \( s_{ab} \). We abuse the terminology somewhat in order to simplify the exposition.
Proposition 2 The first best investments $i_a^{FB}$ and $i_b^{FB}$ are such that

$$i_a^{FB} = i_b^{FB} = \frac{p_{ab}V_{ab,1}(I^{FB}, T', s_{ab}) + p_{b}V_{b,1}(I^{FB}, 0, s_{b})}{c_a + c_b}$$

where $I^{FB} = \min \left[ i_a^{FB}, i_b^{FB} \right] = i_a^{FB} = i_b^{FB}$.

Proof: See Appendix 2.

Note that the parties make identical investments at the first best. This is because any difference in investment $|i_a - i_b|$ would be wasted given the Leontieff production function $\min \left[ i_a, i_b \right]$.

Let $\gamma, 0 < \gamma < 1$, denote party a’s initial stake in the venture. We now show that the first best investments $i_a^{FB}$ and $i_b^{FB}$ can be induced when the parties can commit to maintaining their shares of the payoff in the original proportions ($\gamma, 1 - \gamma$). The first best investment are made despite the problem of double moral hazard (Holmström, 1982). This is because the Leontieff production function makes each party the unique residual claimant to the investment he makes at the optimum (Legros and Matthews, 1993; Hauswald and Hege, 2002).

Proposition 3 The parties are induced to make the first best investments when given initial stakes $\gamma$ and $1 - \gamma$ with

$$\gamma = \frac{c_a}{c_a + c_b}$$

Proof: See Appendix 2.

Proposition 3 requires that the parties’ shares of the payoff remain in the original proportions and not be renegotiated. Thus, when the state $s_{ab}$ is realized and the parties’ stakes must be altered from $(\gamma, 1 - \gamma)$ to $(\gamma', 1 - \gamma')$, the increase in value made possible by such change must be shared in such a way as to maintain the parties’ shares of the payoff in the original proportions $(\gamma, 1 - \gamma)$. Similarly, when the state $s_{hb}$ is realized and the venture must be sold to a trade buyer, the proceeds from the sale must be shared in the original proportions $(\gamma, 1 - \gamma)$.

Absent the ability of the parties to commit to sharing the payoff in the original proportions, these will be determined by renegotiation. Renegotiation may, however, modify the parties’ shares of the final payoff, thereby distorting the parties’ investments away from their first best values. This
is because the payoffs in renegotiation are determined according to the parties' bargaining powers \((\beta, 1 - \beta)\), and these likely differ from the parties’ original stakes \((\gamma, 1 - \gamma)\).\(^{10}\)

We argue in what follows that the various clauses found in shareholder agreements are intended to maintain the founding parties’ payoffs in the proportions \(\gamma\) and \(1 - \gamma\) prescribed by Proposition 3, despite the scope for renegotiation considered in Proposition 1 for example. We consider a number of possible situations that may arise in each of the two states \(s_{ab}\) and \(s_{tb}\), how such situations may alter the parties’ shares of the payoff, and what clause or clauses serve to maintain the parties’ shares.

3 The state \(s_{ab}\): put and call options, pre-emption rights, and tag-along rights

We consider the state \(s_{ab}\) in which the venture should remain the joint property of parties \(a\) and \(b\).

3.1 Put and call options

Without loss of generality, we assume that \(\gamma > \gamma'\) in the present section. This implies that party \(a\) should decrease its stake in the venture from \(\gamma\) to \(\gamma'\) on realization of the state \(s_{ab}\). We show that a put option held by party \(a\) to put a stake \(\gamma - \gamma'\) to party \(b\) at ‘fair’ value, or a call option held by party \(b\) to call a stake \(\gamma - \gamma'\) from party \(a\) at fair value, serve to change the parties’ stakes from \((\gamma, 1 - \gamma)\) to \((\gamma', 1 - \gamma')\) while maintaining the parties’ shares of the payoff in the desired proportions \(\gamma\) and \(1 - \gamma\). We view the ‘fair’ value of the venture as the value of the venture under the conditions that result from the exercise of the option. Shareholder agreements typically include a clause outlining how the venture is to be valued. A popular option is to delegate valuation to an external expert, such as a firm of accountants. Alternatively, the clause may set out a formula for how value is to be determined. For the purpose of our analysis, it is not necessary that the valuation be perfect, but that it be unbiased.

We show in Proposition 4 that fair value is equal to \(V_{ab}(I, T^r, s_{ab})\) given ex ante investment \(I\).

\(^{10}\)We note that the expectation of renegotiation will induce the parties to choose initial stakes that differ from \((\gamma, 1 - \gamma)\) as the parties seek to minimize the distortions due to renegotiation. Nonetheless, renegotiation and its attending distortions will still occur.
Proposition 4 Options at fair value serve to change the parties’ stakes in the venture while maintaining the parties’ original shares of the payoff.

Proof: See Appendix 2. ■

Setting the strike price of the option equal to fair value denies both parties any direct benefit from the exercise of the option. This maintains the parties’ payoffs in the proportions $\gamma$ and $1 - \gamma$. It therefore maintains the parties’ incentives for ex ante investments. Nonetheless, by changing the parties’ stakes from $(\gamma, 1 - \gamma)$ to $(\gamma', 1 - \gamma')$ prior to the transfers, the exercise of the option makes possible the minimization of the value destroyed by transfers.

We note that the choice between a put option granted party $a$ and a call option granted party $b$ is not a matter of indifference, for the necessary and sufficient condition for party $a$ to exercise the put option implies that party $b$ does not exercise the call option and, conversely, the necessary and sufficient condition for party $b$ to exercise the call option implies that party $a$ does not exercise the put option. For example, party $a$ exercises the put option if and only if

$$\gamma V_{ab}(I, T^r, s_{ab}) + \alpha_a B(t_a) > \gamma V_{ab}(I, T, s_{ab}) + \alpha_a B(t_a)$$

$$+ \beta \left[ V_{ab}(I, T^r, s_{ab}) + \alpha_a B(t_a) + \alpha_b B(t_b) - V_{ab}(I, T, s_{ab}) - \alpha_a B(t_a) - \alpha_b B(t_b) \right]$$  \hspace{1cm} (3)

where $\beta$ denotes party $a$’s bargaining power. But inequality (3) implies

$$(1 - \gamma) V_{ab}(I, T^r, s_{ab}) + \alpha_b B(t_b) < (1 - \gamma) V_{ab}(I, T, s_{ab}) + \alpha_b B(t_b)$$

$$+ (1 - \beta) \left[ V_{ab}(I, T^r, s_{ab}) + \alpha_a B(t_a) + \alpha_b B(t_b) - V_{ab}(I, T, s_{ab}) - \alpha_a B(t_a) - \alpha_b B(t_b) \right]$$

The preceding equality implies that party $b$ would not exercise the call option should he be granted one in place of party $a$ being granted the put option. A put option will therefore be granted party $a$ when inequality (3) is true, and a call option will be granted party $b$ when it is false.\footnote{When $\alpha_a > \alpha_b$, a sufficient condition for inequality (3) to hold is that $\beta < \gamma$. The low bargaining power of party $a$ ensures that $a$ wishes to avoid bargaining. This is done by exercising the put option. To establish the sufficiency of the condition $\beta < \gamma$, assume inequality (3) is false. This implies

$$(\gamma - \beta) V_{ab}(I, T^r, s_{ab}) + (1 - \beta) \alpha_a B(t_a) - \beta \alpha_b B(t_b) < (\gamma - \beta) V_{ab}(I, T, s_{ab}) + (1 - \beta) \alpha_a B(t_a) - \beta \alpha_b B(t_b)$$}
The preceding reasoning extends to the case where there exist two additional states $s_a$ and $s_b$ in which the venture should be acquired in its entirety by party $a$ or $b$, respectively. Thus, in state $s_a$ for example, $a$ should have the option to buy $b$’s entire stake at fair value, or $b$ the option to sell that same stake to $a$. Whether a call or a put option is used depends on whether the inequality

$$\gamma V_a (I, 0, s_a) > \gamma V_{ab} (I, T, s_a) + \alpha_a B (t_a)$$

$$+ \beta \left[ - V_a (I, 0, s_a) + \alpha_a B (t_a) + \alpha_b B (t_b) \right]$$

is true or false, where $V_a$ denotes the value of the venture when used by party $a$ alone.

The existence of multiple options corresponding to the states $s_{ab}$, $s_a$, and $s_b$ may lead to deadlock in case both parties have options that they try to exercise simultaneously. Despite there being no direct gain to exercising an option, as its strike price is equal to fair value, a party may opportunistically declare his intent to exercise his option for the purpose of provoking deadlock intended to allow the party to exploit his bargaining power. This can be avoided by giving precedence in exercising the option to the party whose option has the higher strike price.\(^{12}\)

### 3.2 Pre-emption rights and tag-along rights

When a founding party wishes to sell his stake in the venture, pre-emption rights grant the remaining party the right to buy the departing party’s stake at fair value. This is so even where the departing party has been offered a higher price for his stake by an outside party.\(^{13}\)

To motivate the use of pre-emption rights, assume there exists a trade buyer $t_b$ who cannot increase the value of the venture but can extract more value from the venture than can party $a$ for example. Specifically, assume\(^ {14}\)

$$V_{t_b}(I, 0, s_{ab}) < V_{ab}(I, t_a + t^{ab}_b, s_{ab}) + \alpha_a B (t_a) + \alpha_b B (t^{ab}_b)$$  \(4\)

But the preceding inequality is false. To see this, note that the results $\frac{\partial V_{t_b}}{\partial \gamma} < 0$, $\frac{\partial V_{t_b}}{\partial \gamma} > 0$, and $\frac{\partial V_{ab}}{\partial \gamma} + \frac{\partial V_{t_b}}{\partial \gamma} > 0$ when $\alpha_a > \alpha_b$ from the proof of Proposition 1 and the assumption $\gamma > \gamma^r$ imply $t_a > t^r$, $t_b < t^r$, and $T^r < T$. These inequalities combine with the assumptions $V_2 < 0$ and $B' > 0$ to imply that each term on the LHS of the inequality is larger than the corresponding term on the RHS.

\(^{12}\) In the case where the two parties have call options, this effectively reduces to conducting an auction. See Linklaters et al. (1990, p. 61) for a discussion of auction provisions in joint ventures.

\(^{13}\) Pre-emption rights therefore differ from the right of refusal (see Appendix 1). See Kahan (2000) for an analysis of the right of first refusal.

\(^{14}\) In order to simplify the exposition, we assume that $\gamma = \gamma^r$ in the present section. This is without loss of generality.
but

\[ \gamma V_{tb} (I, t_{tb} + t_{lb}, s_{ab}) + \alpha_{tb} B (t_{lb}) \]

\[ \begin{array}{c}
\gamma V_{tb} (I, t_a + t_{lb}, s_{ab}) + \alpha_{tb} B (t_{lb}) \\
> \gamma V_{ab} (I, t_a + t_{lb}, s_{ab}) + \alpha_{a} B (t_{lb}) \\
\end{array} \] (5)

where \( t_{lb} \equiv \arg \max_{t_{lb}} (1 - \gamma) V_{tb} (I, t_{lb} + t_{lb}, s_{ab}) + \alpha_{b} B (t_{lb}) \) and \( t_{lb}^{ab} \) is defined similarly. Such a situation may arise when a minority partner (\( \gamma < \frac{1}{2} \)) sells his stake to a trade buyer who, despite being unable to add value to the venture (inequality (4)) is in a position to transfer more value from the venture than is the selling partner (\( \alpha_{tb} > \alpha_{a} \)).

Inequalities (4) and (5) imply that

\[ (1 - \gamma) V_{tb} (I, t_{lb} + t_{lb}, s_{ab}) + \alpha_{b} B (t_{lb}) \]

\[ < (1 - \gamma) V_{ab} (I, t_a + t_{lb}, s_{ab}) + \alpha_{b} B (t_{lb}) \] (6)

The preceding inequalities imply that both founding parties will wish to renegotiate the distribution of payoffs rather than have party \( a \) sell his stake to the trade buyer. Such renegotiation is ex post efficient, but ex ante inefficient as its distorts the parties’ incentives to invest. We show that pre-emption rights serve to avoid renegotiation, by denying party \( a \) the incentive to threaten selling his stake to the trade buyer in the state \( s_{ab} \) under the sufficient condition that

\[ \gamma V_{b} (I, 0, s_{ab}) \]

\[ + \beta [V_{ab} (I, t_a + t_{lb}^{ab}, s_{ab}) + \alpha_{a} B (t_{a}) + \alpha_{b} B (t_{lb}^{ab}) - V_{b} (I, 0, s_{ab})] \]

\[ < \gamma V_{ab} (I, t_a + t_{lb}^{ab}, s_{ab}) + \alpha_{a} B (t_{a}) \] (7)

where \( V_{b} \) denotes the value of the venture when used by party \( b \) alone. Inequality (7) ensures that party \( a \)’s payoff, were \( b \) to threaten to exercise his pre-emption right in response to \( a \)’s threat to sell his stake to the trade buyer and the founding parties were to renegotiate, is lower than party \( a \)’s payoff from refraining from doing so. Party \( a \) therefore refrains from threatening to sell his stake.

**Proposition 5** Pre-emption rights serve to deter a party from threatening to sell his stake to a trade buyer who would transfer more value from the venture but would not increase its value.

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15 The result \( \frac{\partial V_{ab}}{\partial \alpha_{a}} > 0 \), which can be derived from equations (15) and (16) in the proof of Proposition 1, implies that \( t_{lb} > t_{a} \) for \( \alpha_{tb} > \alpha_{a} \).
Proposition 6 Tag-along rights may serve to deter a party from threatening to sell his stake to a trade buyer who would transfer more value from the venture but would not increase its value.

Proof: See Appendix 2.

Propositions 5 and 6 suggest that pre-emption rights and tag-along rights are substitutes. An advantage of the former is that they dispense with the requirement that the fair value of the venture be computed and rely instead on the price offered by the trade buyer.

4 The state $s_{tb}$: drag-along rights, demand rights, tag-along rights, pre-emption rights, and catch-up clauses

We now consider the state $s_{tb}$, in which a trade buyer can increase the value of the venture. We show that the various clauses we examine serve to maintain the parties’ shares of the payoff in the original proportions $\gamma$ and $1 - \gamma$.

4.1 Drag-along rights and demand rights

As is clear from the definition of state $s_{tb}$, both founding parties will gain from the sale of the venture to the trade buyer. Despite such gains, one of the two parties can profit by vetoing the sale of the venture. This is because such veto will lead to bargaining between the parties, as the other party tries to buy the vetoing party’s assent to the value-increasing sale.

To see that one party will wish to veto the sale of the venture, consider the conditions necessary
for neither party to wish to do so

\[ \gamma V_{tb}(I, 0, s_{tb}) \]
\[ > \gamma V_{ab}(I, T, s_{tb}) + \alpha_{a}B(t_{a}) \]
\[ + \beta [V_{tb}(I, 0, s_{tb}) - [V_{ab}(I, T, s_{tb}) + \alpha_{a}B(t_{a}) + \alpha_{b}B(t_{b})]] \]  (8)

and

\[ (1 - \gamma) V_{tb}(I, 0, s_{tb}) \]
\[ > (1 - \gamma) V_{ab}(I, T, s_{tb}) + \alpha_{b}B(t_{b}) \]
\[ + (1 - \beta) [V_{tb}(I, 0, s_{tb}) - [V_{ab}(I, T, s_{tb}) + \alpha_{a}B(t_{a}) + \alpha_{b}B(t_{b})]] \]  (9)

The inequalities cannot simultaneously be true, as the sum of their LHS equals that of their RHS. Thus, one party will wish to veto the sale if granted the right to do so.

However, denying both parties the right to veto the sale will not necessarily solve the problem that arises from the unwillingness of one party to sell to the trade buyer at the outset. Consider the case where neither holds a veto. Despite this, we can show that one party will hold up the sale, in the expectation of extracting more from the trade buyer by bargaining when the value of the venture is maximized under the trade buyer’s sole ownership. For example, in the case where \( \alpha_{a} > 0 = \alpha_{b} = \alpha_{tb} \), party \( a \) but not party \( b \) will profit from refraining from taking part in the trade sale, for \( a \’ s \) ability to engage in transfers implies that he will be bought out at a premium by the trade buyer. Formally, we have

\[ \gamma V_{tb}(I, t_{a}, s_{tb}) + \alpha_{a}B(t_{a}) \]
\[ + [V_{tb}(I, 0, s_{tb}) - [V_{tb}(I, t_{a}, s_{tb}) + \alpha_{a}B(t_{a})]] \]
\[ = V_{tb}(I, 0, s_{tb}) - (1 - \gamma) V_{tb}(I, t_{a}, s_{tb}) \]
\[ > V_{tb}(I, 0, s_{tb}) - (1 - \gamma) V_{tb}(I, 0, s_{tb}) \]  (10)
\[ = \gamma V_{tb}(I, 0, s_{tb}) \]
for party $a$, and

$$(1 - \gamma) V_{tb} (I, 0, s_{tb})$$

$$+ [V_{tb} (I, 0, s_{tb}) - V_{tb} (I, 0, s_{tb})]$$

$$= (1 - \gamma) V_{tb} (I, 0, s_{tb})$$

for party $b$. In such a case, however, party $b$ will not be offered $(1 - \gamma) V_{tb} (I, 0, s_{tb})$ by the trade buyer, as the latter’s expectation of bargaining with party $a$ implies that the most the trade buyer can offer party $b$ is

$$V_{tb} (I, 0, s_{tb}) - \gamma V_{tb} (I, 0, s_{tb}) + \alpha_B (t_a)$$

where the inequality is true by the inequality in expression (10). Party $b$ too will therefore refuse to sell to the trade buyer, and bargaining will occur despite the denial of veto rights to both founding parties. This will distort the parties’ investments.

We show in Proposition 7 that drag-along rights, which allow a party selling to a trade buyer to force the other party to join the first party in the trade sale, serve to avoid bargaining.

**Proposition 7** Drag-along rights serve to avoid bargaining between the founding parties when the venture is to be sold to a trade buyer.

Proof: It suffices to show that one party will wish to exercise his drag-along rights. But this is immediate from the fact that the two inequalities (8) and (9) cannot simultaneously be false. The party for whom the inequality is true will exercise his drag-along rights.

We now turn to demand rights. These allow a party to force the other party to agree to taking the joint venture public in an IPO. We argue that demand rights are very similar to drag-along rights, in that they are intended to avoid bargaining prior to an IPO.\(^{16}\) As with drag-along rights, demand rights deny the parties veto rights. In contrast to drag-along rights, they do not mandate that the parties sell their entire stakes in the IPO. We view this difference as due to the lower ability

\(^{16}\)This can be formalized by introducing a use $u = \text{ipo}$ and a state $s_{\text{ipo}}$ that are analogous to $u = \text{tb}$ and $s_{\text{tb}}.$
of parties that hold large stakes in a publicly-quoted company to transfer value from the company, because of the constraints imposed by stock exchanges, regulation, and the law.\textsuperscript{17}

### 4.2 Tag-along rights and pre-emption rights

Tag-along rights are in some ways the mirror image of drag-along rights. The latter grant the party arranging a trade sale the right to force the other party to take part in the trade sale. The former grant the party left out of a trade sale arranged by the other party the right to force the trade buyer to buy its stake.

Section 3.2 has shown that there is a role for tag-along rights when one party threatens to sell his stake to a trade buyer who would not increase the value of the venture but would increase the value of the selling party’s stake through larger transfers from the venture. In this section, we show that there is a role for tag-along rights when one party tries to conspire with a trade buyer who can increase the value of the venture to exclude the other party from the increase in value. Specifically, we assume that\textsuperscript{18}

\begin{equation}
\gamma V_{tb} (I, t_{tb} + t_{tb}^{sb}, s_{tb}) + \alpha_{tb} B (t_{tb}) > \gamma V_{tb} (I, 0, s_{tb})
\end{equation}

(11)

It is clear that party a would like to conspire with the trade buyer to have the trade buyer buy a’s stake at the price $\gamma V_{tb} (I, t_{tb} + t_{tb}^{sb}, s_{tb}) + \alpha_{tb} B (t_{tb})$. Party a’s payoff would then be greater than the payoff $\gamma V_{tb} (I, 0, s_{tb})$ he would obtain if he were to share with b the increase in value from the trade sale in such as way as to maintain the parties’ shares of the payoff in the original proportions.

Party a’s gain is at the expense of party b, whose payoff after negotiating with the trade buyer

\textsuperscript{17}For example, stock exchanges require companies to abide by ‘Continuing Obligations’ that are aimed at protecting outside shareholders.

\textsuperscript{18}A sufficient condition for inequality (11) to hold is that $\alpha_{tb} = 0$. This implies that $t_{tb}^{sb} = 0$ and reduces inequality (11) to

$\gamma V_{tb} (I, t_{tb}, s_{tb}) + \alpha_{tb} B (t_{tb}) > \gamma V_{tb} (I, 0, s_{tb})$

The preceding inequality is true from the assumption that transfers do occur when the venture has more than a single owner.
for the latter to buy the former’s stake is

\[
(1 - \gamma) V_{tb} (I, t_{tb} + t_{tb}^{b}, s_{tb}) + \alpha_b B (t_{tb}^b)
\]

\[
+ [V_{tb} (I, 0, s_{tb}) - V_{tb} (I, t_{tb} + t_{tb}^{b}, s_{tb}) + \alpha_b B (t_{tb}^b), s_{tb})]
\]

\[
= V_{tb} (I, 0, s_{tb}) - \gamma V_{tb} (I, t_{tb} + t_{tb}^b, s_{tb}) + \alpha_b B (t_{tb})
\]

\[
< V_{tb} (I, 0, s_{tb}) - \gamma V_{tb} (I, 0, s_{tb})
\]

\[
= (1 - \gamma) V_{tb} (I, 0, s_{tb})
\]

where the inequality is true from inequality (11). The founding parties’ payoffs are thereby altered from the original proportions \(\gamma\) and \(1 - \gamma\). We show in Proposition 8 that tag-along rights granted party \(b\) serve to maintain the parties’ payoffs in these proportions.

**Proposition 8** Tag-along rights preclude a party from conspiring with a trade buyer to exclude the other party from sharing in the increase in value made possible by the sale of the venture to the trade buyer.

Proof: It suffices to show that party \(b\) will exercise his tag-along rights, for the obligation for the trade buyer to buy the parties’ stakes on the same terms and conditions in that case implies that the parties will receive the desired \(\gamma V_{tb} (I, 0, s_{tb})\) and \((1 - \gamma) V_{tb} (I, 0, s_{tb})\). But that party \(b\) will exercise his drag-along rights is immediate from inequality (12).

We have seen in Section 3.2 that pre-emption rights and tag-along rights are to some extent substitutes in the case where one party threatens to sell the venture to a trade buyer who would extract more value from the venture but would not increase its value. These rights are also substitutes in the present case. In particular, if

\[
\gamma V_{b} (I, 0, s_{tb}) + \beta [V_{tb} (I, 0, s_{tb}) - V_{b} (I, 0, s_{tb})] < \gamma V_{tb} (I, 0, s_{tb})
\]

then party \(b\)’s pre-emption rights can be shown to preclude party \(a\) from conspiring with the trade buyer. This is because party \(a\)’s payoff when renegotiating with party \(b\) following \(b\)’s exercise of his pre-emption rights is lower than \(a\)’s payoff from a straightforward trade sale. If the reverse inequality holds, then pre-emption rights fail to do so.
4.3 Catch-up clauses

We recall from Section 3.1 that a party may be granted a call option on the other party’s stake. Such option may be abused. Consider for example the state $s_{tb}$ in which the venture should be sold to a trade buyer. The holder of the option, say party $a$, clearly will want to exercise the call prior to the sale of the venture to the trade buyer if he expects the strike price not yet to reflect the increase in the value of the venture that will be made possible by the trade sale (perhaps because neither the external valuation expert nor party $b$ are yet aware of the impending trade sale). Exercising the option allows party $a$ to receive a greater fraction of the increase in value from the trade sale.

To avoid this outcome, which would distort ex ante investment, catch-up clauses grant party $b$ the right to any additional gain made by party $a$ as a result of party $a$ having exercised his call option on party $b$'s stake shortly before selling the venture. This maintains the parties’ payoffs in the desired proportions $\gamma$ and $1 - \gamma$.

4.4 Summary of Sections 3 and 4

The results in Sections 3 and 4 have shown that the various clauses we consider serve to maintain the parties’ shares of the payoff in the original proportions $\gamma$ and $1 - \gamma$ in both states $s_{ab}$ and $s_{tb}$ and under a wide range of circumstances. As a result, as noted in Proposition 3, the parties will be induced to make the first best investments $i^{FB}_a = i^{FB}_b = I^{FB}$.

We have not explicitly considered the implications of the control conferred by majority ownership for our analysis. Would such control alter our main results? We argue that the answer is in the negative. Consider the minority owner first. The control exerted by the majority owner would diminish the value of clauses such as tag-along and demand rights to the minority owner only in case the majority owner were able to override these clauses. Now consider the majority owner. Control would allow the majority owner to dispense with a clause such as drag-along rights only in case he were able to sell the entire assets of the venture to the trade buyer, leaving the minority owner with a claim on an empty shell. A well-functioning legal system is likely to preclude both actions on the part of the majority owner.
5 Continuation and termination in alliances

We briefly consider the issue of whether to continue or terminate an alliance. An alliance is a form of joint undertaking that often has a pre-specified finite life, after which it is terminated unless the party with the option to extend its life for an additional period chooses to do so. We argue in this section that the purpose of this option is to avoid renegotiation.

We modify the model of the preceding sections as follows. We denote the value of the alliance $V_c(I,s)$ when continued and $V_t(I,s)$ when terminated. We neglect ex post transfers for simplicity but without loss of generality. Let $s_c$ denote the state of the world in which the alliance should be continued and $s_t$ denote that in which it should be terminated. Thus,

$$V_c(I,s_c) > V_t(I,s_c)$$

and

$$V_c(I,s_t) < V_t(I,s_t)$$

To motivate the use of the option to extend the life of the alliance, consider state $s_c$ in which the alliance should be continued and each party has payoff $\gamma V_c(i_a,b,i_b,s_c)$. Can a party, say party $a$, profit from threatening not to agree to the continuation of the alliance for the purpose of bargaining with party $b$? Party $a$’s payoff from doing so is

$$\gamma V_t(I,s_c) + \beta [V_c(I,s_c) - V_t(I,s_c)]$$

$$= \beta V_c(I,s_c) - (\beta - \gamma) V_t(I,s_c)$$

$$> \gamma V_c(I,s_c)$$

for $\beta > \gamma$. This problem cannot be solved by specifying that the life of the alliance be infinite, for party $a$ would then threaten not to agree to the termination of the alliance in state $s_t$. The problem, of course, is that a change in the status of the alliance that requires party $a$’s agreement provides $a$ with an opportunity to exploit his greater bargaining power.

The problem can be solved by granting party $b$ the option to extend the life of the alliance, for such an option dispenses party $b$ from seeking party $a$’s approval. The option will not be exploited by party $b$, for his lower bargaining power implies that he has nothing to gain from bargaining.
Indeed, consider an attempt by party \( b \) to threaten continuing the alliance in state \( s_t \). His payoff from doing so is

\[
(1 - \gamma) V_c(I, s_t) + (1 - \beta) [V_t(I, s_t) - V_c(I, s_t)]
\]

\[
= (1 - \beta) V_t(I, s_t) + (\beta - \gamma) V_c(I, s_t)
\]

\[
< (1 - \gamma) V_t(I, s_t)
\]

as \( V_c(I, s_t) < V_t(I, s_t) \). Party \( b \) will therefore not exploit his option.

\section{Further Issues}

\subsection{Contracting issues and renegotiation}

The analysis of Sections 3 and 4 has revolved around the idea that clauses are used to avoid the change in the parties’ shares that can be expected to result from renegotiation. Yet, renegotiation often occurs in practice (Lerner and Tsai, 2000). We ascribe such renegotiation to three issues in contracting. Renegotiation is likely to arise in the presence of financing constraints, in the presence of asymmetric information, and where there are conflicting and missing clauses.

Consider financing constraints first. Recall that our model requires the parties’ initial stakes in the venture to be in the proportions \( \gamma \) and \( 1 - \gamma \). But wealth constraints on one or the other party may preclude such division of ownership at the outset. In such case, should the wealth constraint be relaxed at some point in the future, perhaps as a result of a change in the availability of external finance, one would expect the parties to renegotiate their shares.\(^{19}\)

Now consider asymmetric information. Our model has assumed that, on realization of the state, there was no asymmetry of information among the parties. Yet, at least in the case where one party is to buy out the other, it is likely that each party has better knowledge of the value of the venture to itself than does the other party. Under such circumstances, a party that has been granted the put option may mistakenly believe that the value of the venture is higher for the other party than it is for himself, and exercise his put option when he should not. Renegotiation would occur in such case.

\(^{19}\)Lerner and Tsai (2000) document such patterns in biotechnology alliances.
Finally, consider missing clauses. Note that the various clauses we have considered may sometimes be in conflict. It is clear for example that a party cannot simultaneously exercise his pre-emption rights and be subjected to his partner’s drag-along rights. The problem caused by conflicting clauses may be mitigated by assigning precedence in the exercise of the clauses (Linklaters et al., 1990, p. 61), or by omitting some clauses. It is unlikely to be eliminated entirely. As a result, renegotiation may occur.

We acknowledge the importance of these contracting issues and their potential to distort ex ante investments. We trust that the resulting distortions in ex ante investments are, in some cases at least, lower than in the total absence of any clause.

### 6.2 Valuation

Our analysis has assumed that the fair value of the venture could be determined with relative ease. Such is generally not the case. Indeed, the difficulty in valuing private equity has for example complicated attempts at estimating the risk and return on venture capital (see Cochrane, 2001, for a short survey and one such attempt). As noted in Section 3.2, such valuation issues may privilege tag-along rights over pre-emption rights, for the former dispense with the requirement that the fair value of the venture be computed.

### 7 Conclusion

We have presented an explanation for a number of key clauses that often appear in shareholder agreements, such as those between partners in a joint venture and between a venture capitalist and an entrepreneur. The clauses preserve the parties’ incentives to make ex ante investments when ex post renegotiation may alter the parties’ shares of the payoff.

Many of the clauses we have discussed recall the rules and regulations that govern tender offers and the sale of control blocks. For example, tag-along rights recall the mandatory bid rule, which

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20 The same party may, however, simultaneously possess both pre-emption rights and drag-along rights.

21 What clauses will be found in a given contract and which party will be the beneficiary of these clauses will depend on the parties' original and renegotiated stakes \((\gamma, 1 - \gamma)\) and \((\gamma', 1 - \gamma')\), on the parties’ bargaining powers \((\beta, 1 - \beta)\), and on whether the inequalities hold that give rise to circumstances in which renegotiation and bargaining may occur (e.g. inequalities (4) and (5); inequality (11)) and make one or more of the clauses we have considered effective in avoiding such renegotiation (e.g. inequality (7); inequality (13)).

requires a bidder to bid for all the shares of a target, and the equal opportunity rule, which requires the acquirer of a control block to offer non-controlling shareholders the same terms and conditions as offered the selling blockholder. Similarly, drag-along rights recall squeezeouts, which allow the acquirer of a control block to ‘squeeze’ minority shareholders out of the firm.

Yet, there are differences. Thus, the offer made to target shareholders in a tender offer may take the form of a two-tier offer, and the market rule rather than the equal opportunity rule governs the sale of control blocks in many jurisdictions, including the United States. In contrast to the equal opportunity rule, the market rule does not impose on the acquirer of a control block the requirement to extend his offer to non-controlling shareholders. Finally, the price at which minority shareholders are squeezed needs satisfy only an appraisal standard, which does not entitle minority shareholders to the premium offered the selling blockholder.

Why the differences? In the case of a tender offer, the answer has to do with the need to ensure that the acquisition is not precluded by the free rider problem (Grossman and Hart, 1980). But there should be no such problem in the case of the sale of a control block. In that case, our analysis suggests that the differences we have mentioned are related to the need to induce ex ante investment. Only a controlling blockholder makes such investment. Small, dispersed shareholders do not, as they play no role in management and therefore make no investment beyond the price of their shares. That only the controlling blockholder makes an ex ante investment, for example in bringing forth a value creating change of control transaction, suggests that only the controlling blockholder should profit from such a transaction. This is in order to maintain his incentives to making the requisite investment. The appraisal remedy, which effectively grants small shareholders the right to put their shares to the firm, ensures that small shareholders are not harmed by change of control transactions, but also denies them the benefit of these transactions. The need to induce the making of ex ante investment on the part of the controlling blockholder, and on his part only, suggests that this is as it should be.

\[23\text{See Easterbrook and Fischel (1991) for a forceful exposition of this argument.}\]
Appendix 1: An overview of shareholder agreements

Standard shareholder agreements typically contain the following articles or groups of articles (Bernstein, 1988; Freedman, 1994; Martel, 1991; Stedman and Jones, 1990):

- Termination of prior agreements between some or all shareholders regarding the organization and affairs of the company, as well as warranties and covenants specifying that all shares are free and clear of all claims.
- Provision of control: Designation of the rights and duties of the shareholders in the management of the company, and requirement of prior unanimous consent for major decisions such as the declaration of any dividend and the issuance or sale of shares.
- Restrictions on the transfer of shares: The shareholders commit not to sell, pledge, or charge their shares except with the prior written consent of all other shareholders.
- Survivorship arrangements: Upon the death of any shareholder, the personal representatives of the deceased shall sell the shares of the deceased to the company, typically at a price specified in the article on valuation. Life insurance policies will be issued to the benefit of the shareholders to ensure that this article can be enforced.
- Valuation: The ‘fair’ value of the shares is generally determined by an external expert, or it is based on a previously agreed upon valuation formula.
- Right of first refusal: A shareholder offered to sell his shares to an outside investor at some price is required to offer his shares to the other shareholders at the same price. If the other shareholders decline, the first shareholder is free to sell his shares to the outside investor.
- Pre-emption rights: A shareholder wishing to sell his stake in the company is required to offer his shares to the other shareholders. Pre-emption rights can take several forms. In the extreme, selling the shares to an outside investor is actually prohibited.
- Put options: A shareholder is granted put options on the shares held by the other shareholders. The strike price is generally the ‘fair’ value of the shares.
- Call options: Similar to put options.
• Catch up clauses: When a shareholder exercises a call option, the selling shareholder maintains a claim on part of the payoff subsequently realized by the first shareholder in a trade sale or an IPO.

• Drag-along rights: In case a shareholder sells his stake to an outside investor, drag-along rights grant the investor the right to buy out the other shareholders’ stakes at the same price and on the same terms as the first shareholder’s stake. Drag-along rights can be viewed as conditional call options granted the outside investor.

• Tag-along rights (or piggy-back rights, or co-sale agreements): In case a shareholder sells his stake to an outside investor, tag-along rights grant the other shareholders the right to require the outside investor to buy these shareholders’ stakes at the same price and on the same terms as the first shareholder’s stake. Tag-along rights can be viewed as conditional put options granted all shareholders.

• Demand rights (or initial public offering clauses): Shareholders agree in advance the circumstances in which they will take the company public. Demand rights ensure that the company will be taken public once a prespecified level of profit is achieved, or when the company has a specific need for outside finance. Demand rights may require all shareholders to participate in the offering.

• Non-competition: Each and every shareholder undertakes not to compete with the venture.

• Dispute resolution and arbitration: The shareholders agree to follow a specified procedure to resolve disputes. The procedure may specify the appointment of an arbitrator.
Appendix 2: Proofs

**Proof of Proposition 1:** The stake $\gamma^*$ is the solution to the problem

$$\max_{\gamma^r} V_{ab} (I, t_a^r + t_b^r, s_{ab}) + \alpha_a B (t_a^r) + \alpha_b B (t_b^r)$$

where

$$t_a^r = \arg \max_{t_a} \gamma^r V_{ab} (I, \hat{t}_a + t_a^r, s_{ab}) + \alpha_a B (\hat{t}_a)$$

and

$$t_b^r = \arg \max_{t_b} (1 - \gamma^r) V_{ab} (I, t_a^r + \hat{t}_b, s_{ab}) + \alpha_b B (\hat{t}_b)$$

The corresponding first-order conditions are

$$V_{ab,2} (I, t_a^r + t_b^r, s_{ab}) \left[ \frac{\partial t_a^r}{\partial \gamma^r} + \frac{\partial t_b^r}{\partial \gamma^r} \right] + \alpha_a B' (t_a^r) \frac{\partial \gamma^r}{\partial t_a^r} + \alpha_b B' (t_b^r) \frac{\partial \gamma^r}{\partial t_b^r} = 0 \quad (14)$$

$$\gamma^r V_{ab,2} (I, t_a^r + t_b^r, s_{ab}) + \alpha_a B' (t_a^r) = 0 \quad (15)$$

and

$$(1 - \gamma^r) V_{ab,2} (I, t_a^r + t_b^r, s_{ab}) + \alpha_b B' (t_b^r) = 0 \quad (16)$$

From equations (15) and (16), we obtain

$$\frac{\partial t_a^r}{\partial \gamma^r} = \frac{V_{ab,2} [V_{ab,22} + \alpha_b B'']}{\gamma^r V_{ab,22} \alpha_b B'' + \alpha_a B'' [(1 - \gamma^r) V_{ab,22} + \alpha_b B'']} < 0$$

and

$$\frac{\partial t_b^r}{\partial \gamma^r} = \frac{V_{ab,2} [V_{ab,22} + \alpha_a B'']}{\gamma^r V_{ab,22} \alpha_a B'' + \alpha_a B'' [(1 - \gamma^r) V_{ab,22} + \alpha_b B'']} > 0$$

Substituting equations (15) and (16) into equation (14), we have

$$\frac{(1 - \gamma^r)}{\gamma^r} \frac{\partial t_a^r}{\partial \gamma^r} + \gamma^r \frac{\partial t_b^r}{\partial \gamma^r} = 0$$

$$\Leftrightarrow \gamma^r = \frac{V_{ab,22} (I, T^r, s_{ab}) + \alpha_a B''}{V_{ab,22} (I, T^r, s_{ab}) + \alpha_a B'' + V_{ab,22} (I, T^r, s_{ab}) + \alpha_b B''}$$

**Proof of Proposition 2:** The parties make identical investments at the first-best, for any difference in investment $|i_a - i_b|$ would be wasted given the Leontief production function $\min \{i_a, i_b\}$.

We therefore rewrite problem (1) as

$$\max_i p_{ab} \left[ V_{ab} (\hat{I}, T^r, s_{ab}) + \alpha_a B (t_a^r) + \alpha_b B (t_b^r) \right] + p_{ab} V_{ab} \left( \hat{I}, 0, s_{ab} \right) - \frac{1}{2} (c_a + c_b) \hat{I}^2$$
The preceding problem has first-order condition

\[ p_{ab} V_{ab,1} (I^{FB}, T^r, s_{ab}) + p_{ab} V_{tb} (I^{FB}, 0, s_{tb}) - (c_a + c_b) I^{FB} = 0 \]

\[ \Leftrightarrow I^{FB} = \frac{p_{ab} V_{ab,1} (I^{FB}, T^r, s_{ab}) + p_{ab} V_{tb}(I^{FB}, 0, s_{tb})}{c_a + c_b} \]

**Proof of Proposition 3:** The problems solved by parties \( a \) and \( b \) are

\[ \max_{i_a} p_{ab} \gamma V_{ab} \left( \min \left[ \hat{i}_a, \hat{i}_b \right], T^r, s_{ab} \right) + \alpha_a B (t_a^r) + p_{tb} \gamma V_{tb} \left( \min \left[ \hat{i}_a, \hat{i}_b \right], 0, s_{tb} \right) - \frac{1}{2} c_a \hat{a}_a^2 \]

and

\[ \max_{i_b} (1 - \gamma) V_{ab} \left( \min \left[ \hat{i}_a, \hat{i}_b \right], T^r, s_{ab} \right) + \alpha_b B (t_b^r) + p_{ab} (1 - \gamma) V_{tb} \left( \min \left[ \hat{i}_a, \hat{i}_b \right], 0, s_{tb} \right) - \frac{1}{2} c_b \hat{b}_b^2 \]

These have first-order conditions

\[ p_{ab} \gamma V_{ab,1} (\min [i_a, i_b], T^r, s_{ab}) + p_{ab} \gamma V_{tb,1} (\min [i_a, i_b], 0, s_{tb}) = c_a i_a \]

and

\[ p_{ab} (1 - \gamma) V_{ab} (\min [i_a, i_b], T^r, s_{ab}) + p_{ab} (1 - \gamma) V_{tb} (\min [i_a, i_b], 0, s_{tb}) = c_b i_b \]

It suffices to note that setting \( \gamma = \frac{c_a}{c_a + c_b} \) yields the desired result.

**Proof of Proposition 4:** Consider the case where party \( a \) has been granted a put option at fair value on the stake \( \gamma - \gamma^* \). Let \( F \) denote the fair value of the venture under the conditions that result from the exercise of the option. Following the realization of the state, the parties choose ex post transfers so as to

\[ \max_{\hat{t}_a} \gamma V_{ab} (I, \hat{t}_a + t_b, s_{ab}) + [- (\gamma - \gamma^*) V_{ab} (I, \hat{t}_a + t_b, s_{ab}) + (\gamma - \gamma^*) F] + \alpha_a B (\hat{t}_a) \]

\[ = \max_{\hat{t}_a} \gamma V_{ab} (I, \hat{t}_a + t_b, s_{ab}) + (\gamma - \gamma^*) F + \alpha_a B (\hat{t}_a) \]

and

\[ \max_{\hat{t}_b} (1 - \gamma^*) V_{ab} (I, t_a + \hat{t}_b, s_{ab}) - (\gamma - \gamma^*) F + \alpha_b B (\hat{t}_b) \]

Clearly, parties \( a \) and \( b \) will engage in the transfers \( t_a^r \) and \( t_b^r \), as desired. The fair value \( F \) of the venture under the conditions that result from the exercise of the option therefore equals

\[ \text{\textsuperscript{24}The case where party } b \text{ has been granted a call option is similar.} \]
$V_{ab} (I, T^r, s_{ab})$. The strike price equals $(\gamma - \gamma^r) V_{ab} (I, T^r, s_{ab})$, thereby ensuring that party $a$ does indeed exercise the put option.

The preceding implies that, when making the ex ante investments, the parties' payoffs conditional on the state $s_{ab}$ being realized are

$$
\gamma^r V_{ab} (I, T^r, s_{ab}) + (\gamma - \gamma^r) F + \alpha_a B (t_a^r) \\
= \gamma^r V_{ab} (I, T^r, s_{ab}) + (\gamma - \gamma^r) V_{ab} (I, T^r, s_{ab}) + \alpha_a B (t_a^r) \\
= \gamma V_{ab} (I, T^r, s_{ab}) + \alpha_a B (t_a^r)
$$

for party $a$ and $(1 - \gamma) V_{ab} (I, T^r, s_{ab}) + \alpha_b B (t_b^r)$ for party $b$. The parties' payoffs have been maintained in the desired proportions $\gamma$ and $1 - \gamma$.

**Proof of Proposition 5:** Inequality (7) ensures that party $a$ will not attempt to sell his stake to the trade buyer if he expects party $b$ to threaten to exercise his pre-emption rights. It remains to show that party $b$ will indeed threaten to exercise these rights. His payoff if he does is

$$
(1 - \gamma) V_b (I, 0, s_{ab}) \\
+ (1 - \beta) \left[ V_{ab} (I, t_a + t_{ab}^b, s_{ab}) + \alpha_a B (t_a) + \alpha_b B (t_{ab}^b) - V_b (I, 0, s_{ab}) \right] \\
> (1 - \gamma) V_{ab} (I, t_a + t_{ab}^b, s_{ab}) + \alpha_b B (t_{ab}^b)
$$

where the inequality is true from inequality (7). His payoff if he does not and renegotiates with party $a$ is

$$
(1 - \gamma) V_{ab} (I, t_a + t_{ab}^b, s_{ab}) + \alpha_b B (t_{ab}^b) \\
+ (1 - \beta) \left[ V_{ab} (I, t_a + t_{ab}^b, s_{ab}) + \alpha_a B (t_a) + \alpha_b B (t_{ab}^b) - V_{ab} (I, t_a + t_{ab}^b, s_{ab}) + \alpha_b B (t_{ab}^b) \right] \\
< (1 - \gamma) V_{ab} (I, t_{ab} + t_{ab}^b, s_{ab}) + \alpha_b B (t_{ab}^b) \\
+ \left[ V_{ab} (I, t_a + t_{ab}^b, s_{ab}) + \alpha_a B (t_a) + \alpha_b B (t_{ab}^b) - V_{ab} (I, t_{ab} + t_{ab}^b, s_{ab}) + \alpha_b B (t_{ab}^b) \right] \\
= V_{ab} (I, t_a + t_{ab}^b, s_{ab}) + \alpha_a B (t_a) + \alpha_b B (t_{ab}^b) \\
- \gamma V_{ab} (I, t_{ab} + t_{ab}^b, s_{ab}) + \alpha_b B (t_{ab}^b) \\
< V_{ab} (I, t_a + t_{ab}^b, s_{ab}) + \alpha_a B (t_a) + \alpha_b B (t_{ab}^b) \\
- \gamma V_{ab} (I, t_a + t_{ab}^b, s_{ab}) + \alpha_a B (t_a) \\
= (1 - \gamma) V_{ab} (I, t_a + t_{ab}^b, s_{ab}) + \alpha_b B (t_{ab}^b)
$$
where the second inequality is true by inequality (5).

**Proof of Proposition 6:** Let $P$ denote the price that the trade buyer would pay for the venture. This price must be such that

$$\gamma P > \gamma V_{ab} (I, t_a + t_a^{ab}, s_{ab}) + \alpha_a B (t_a)$$  \hspace{1cm} (17)

and

$$P \leq V_{tb} (I, 0, s_{ab})$$  \hspace{1cm} (18)

Both inequalities are necessary for party $a$’s threat to sell his stake to the trade buyer $tb$ to be credible. Party $a$ would not wish to sell his stake if inequality (17) were false, and the trade buyer $tb$ would not wish to buy the venture if inequality (18) were false.

Combined with inequality (4), inequalities (17) and (18) imply the necessary condition for the trade buyer to be willing to buy the venture despite the presence of tag-along rights

$$V_{ab} (I, t_a + t_a^{ab}, s_{ab}) + \frac{\alpha_a}{\gamma} B (t_a)$$

$$< V_{ab} (I, t_a + t_a^{ab}, s_{ab}) + \alpha_a B (t_a) + \alpha_b B (t_b^{ab})$$

This condition is false when $\alpha_b = 0$ for example.
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