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ABSTRACT

An Analysis of Shareholder Agreements*

Shareholder agreements govern the relations among shareholders in privately-held companies, 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 to preserve the parties' incentives to make *ex ante* investments when *ex post* renegotiation may alter the parties' shares of the pay-off. We extend our framework to discuss the use of other clauses, such as the option to extend the life of a business alliance.

JEL Classification: G34
Keywords: call options, catch-up clauses, demand rights, drag-along rights, pre-emption rights, put options, shareholder agreements and tag-along rights

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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 to preserve the parties' incentives to make ex ante investments by favoring an efficient allocation of resources, and by minimizing ex post value-decreasing transfers. Without these clauses, the need and the opportunity for renegotiation arise when it is desirable to alter the parties' stakes in order to minimize the value destroyed by transfers from the venture, and when the venture may be sold to a trade buyer or taken public in an IPO. However, unlike the clauses that are found in shareholder agreements, renegotiation cannot easily be

[1] Standard 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.

made state-dependent. Hence, even costless, efficient renegotiation would lead to a distortion in the parties' ex ante investment, because it may alter the parties' shares of the payoff.

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 vetoing 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 analysis closely follows that of the "hold-up" problem (Williamson, 1985; Grossman and Hart, 1986; Hart and Moore, 1990), whereby the making of an investment that is specific to a venture makes the parties vulnerable to opportunism on the part of their partners in the venture. As noted by Nöldeke and Schmidt (1995), options can be used to solve the hold-up problem under some circumstances.[2] An important insight of our paper is that the various clauses we consider can each be viewed as an option, 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 these implicit options unique is that their exercise is 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 when the venture is taking public.

[2] In our setting, where partners both invest, and then both have the opportunity of transferring funds, the first-best outcome in Nöldeke and Schmidt (1995) does not hold.

The state-dependence 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.

Joint ventures and venture capital have received much attention in the academic literature. Allen and Phillips (2000), Bhattacharyya and Lafontaine (1995), Darrough and Stoughton (1989), Gomes and Novaes (2001), Hauswald and Hege (2002), McConnell and Nantell (1985), Mohanram and Nanda (1998), Pisano (1989), Oxley (1997), and Rey and Tirole (1998) study various aspects of joint ventures, but not the clauses analyzed in this paper. Nor do Admati and Pfleiderer (1994), Aghion, Bolton and Tirole (2000), Bergemann and Hege (1998), Berglöf (1994), Cornelli and Yosha (1997), Gompers (1995), Hellmann (1998, 2001), Kaplan and Strömberg (1999), Repullo and Suarez (1998), Schmidt (1999), and Smith (2001), who study venture capital contracts. Contracting in non-venture backed private companies has received surprisingly little attention, despite the fact that such companies as a group typically account for a larger share of economic activity than do stock market-listed firms (Moskowitz and Vissing-Jørgensen, 2001; Fenn et al., 1995; Fenn and Liang, 1998). Previous work on privately-held companies typically focuses on financing or valuation issues (Wruck, 1989; Berger and Udell, 1998; Gompers and Lerner, 1999; Lerner, 2000; Lerner and Tsai, 2000). There appear to be no prior contract-theoretic analyses of the clauses found in shareholder agreements.[3]

We proceed as follows. We present the initial setting in Section 2. We analyze the case where the venture must remain the property of one or both founding parties in Section 3. We analyze the case in which the venture must be sold to a trade buyer or taken public in an IPO and we discuss issues related to the allocation of control in Section 4. We discuss continuation and termination in alliances in Section 5. Section 6 discusses further issues. Section 7 concludes by discussing the similarities and differences between shareholder agreements and the rules and regulations that govern tender

[3] Although the legal community has paid a lot of attention to shareholder agreements that they view as one of the most common legal contracts (see, e.g., Stedman and Jones, 1990), a search in the American Economic Association's EconLit database on June 14, 2002, shows no reference with keywords such as "shareholder agreements".

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 $\frac{1}{2}c_i i_i^2$, $i \in \{a, b\}$.

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.[4] 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 $B_i(t_i) \equiv \alpha_i B(t_i)$, with $\alpha_i \geqslant 0$ an index of the relative importance of i's personal benefit. In our setting, transfers create a private value environment that further leads to potential disagreement between partners about their preferred allocation of shares.

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,

[4] 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 (Reich and Mankin, 1986, and Doz and Hamel, 1998). Unlike theft or tunneling, such transfers can be engaged in by both parties to the venture, rather than by the majority partner alone.

We consider two non-contractible 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}. For simplicity, 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). This allows us to concentrate on transfers 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 α_i, $i \in \{a, b, tb\}$, as the single cause of the parties' possibly differing incentives to engage in transfers. However, our results are robust to changes in the formulation, as long as the preferred allocation of the shares after the realization of the state differs from the optimal allocation at the beginning of the game.

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 $B'' = cst < 0$. 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 $V_{u,2}(I,0,s)+B_i'(0)<0$. This implies that no transfer takes place when the 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 remainder of the present section is to solve the model in the absence of clauses. We derive the optimal allocation of shares, we show that in the absence of transfers the first-best investments can be induced even under joint ownership, and we discuss the effect of renegotiation when transfers are considered.

In the spirit of backward induction, we initially consider the ex post stakes γ^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 γ^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 $T^r=t_a^r+t_b^r$ with $t_a^r\equiv\arg\max_{\widehat{t}_a}\gamma^r V_{ab}\left(I,\widehat{t}_a+t_b^r,s_{ab}\right)+\alpha_a B\left(\widehat{t}_a\right)$ and t_b^r similarly defined.

Proof: See Appendix 2.■

Proposition 1 implies that $\gamma^r\lesseqgtr\frac{1}{2}$ as $\alpha_a\gtreqless\alpha_b$. 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 investment in the absence of transfers. We show that the first best investments i_a^{FB} and i_b^{FB} obtain. These are the solution to the problem

$$\underset{\widehat{i}_a,\widehat{i}_b}{Max}\ p_{ab}V_{ab}\left(\widehat{I},0,s_{ab}\right)+p_{tb}V_{tb}\left(\widehat{I},0,s_{tb}\right)-\frac{1}{2}c_a\widehat{i}_a^2-\frac{1}{2}c_b\widehat{i}_b^2 \tag{1}$$

where $\widehat{I}\equiv\min\left[\widehat{i}_a,\widehat{i}_b\right]$. Let γ, $0<\gamma<1$, denote party a's initial stake in the venture.

Proposition 2 *In the absence of transfers, the first best investments i_a^{FB} and i_b^{FB} are such that*

$$i_a^{FB}=i_b^{FB}=\frac{p_{ab}V_{ab,1}\left(I^{FB},0,s_{ab}\right)+p_{tb}V_{tb,1}\left(I^{FB},0,s_{tb}\right)}{c_a+c_b} \tag{2}$$

where $I^{FB}=\min\left[i_a^{FB},i_b^{FB}\right]=i_a^{FB}=i_b^{FB}$, and they are achieved when initial stakes γ and $1-\gamma$ satisfy

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

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 $\min\left[i_a,i_b\right]$. In addition, a direct implication of Proposition 2 is that the expectation of ex post transfers leads partners to underinvest.

The first best investments are made by the partners with the appropriate allocation of shares 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).

The efficiency result requires that the parties' expected shares of the final payoff remain as

specified in Proposition 2. However, the presence of transfers in state s_{ab} and the threat of transfers in state s_{tb} imply that, after the state is realized and the parties' stakes must be altered away from $(\gamma, 1-\gamma)$ (to $(\gamma^r, 1-\gamma^r)$ in state s_{ab} and $(0,0)$ in state s_{tb}), the increase in value made possible by such a change must be shared in such a way as to maintain the parties' shares of the payoff in the original proportions $(\gamma, 1-\gamma)$.

Costless, efficient renegotiation will generally modify the parties' shares of the final payoff to the ex post optimal allocation. Expected renegotiation will imply a distortion in the initial allocation away from γ, so that the initial allocation and the expected distribution of the payoffs in the various states after renegotiation give the partners an expected allocation as close as possible to $(\gamma, 1-\gamma)$. 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 $(\gamma, 1-\gamma)$. However, a first-best investment will not obtain because transfers in state s_{ab} are non-zero, and because the concavity of the production function implies that adjusting the initial allocation so as to generate an expected allocation $(\gamma, 1-\gamma)$ is dominated by a solution that would ensure that each partner is guaranteed to obtain a fraction $(\gamma, 1-\gamma)$ whatever the state. This is because the bargaining outcome cannot be designed in a state-dependent way.[5]

We argue in what follows that the various clauses found in shareholder agreements are intended to maintain the founding parties' payoffs in the proportions γ and $1-\gamma$ prescribed by Proposition 2 in both states, and hence reduce the scope for renegotiation. It should be noted that although we consider costless, efficient renegotiation as a benchmark, we keep in mind that renegotiation is traditionnally viewed as a costly mechanism that partners want to avoid at the outset (Linklaters et al, 1990, and Stedman and Jones, 1990). We initially consider the state s_{ab} in which the venture remains the joint property of parties a and b.

[5] If renegotiation was impossible, the allocation of shares would balance the benefit of increasing investment by making the allocation close to γ and the benefit of reducing transfers (or threat of transfers) by choosing an allocation closer to γ^r. Transfers would not be minimized, which would reduce investment. In this model, renegotiation increases flexibility in the allocation of shares and leads to higher levels of investment than a full-commitment outcome.

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

3.1 Put and call options

Without loss of generality, we assume that $\gamma > \gamma^r$ in the present section. This implies that party a should decrease its stake in the venture from γ to γ^r on realization of the state s_{ab}. We show that a put option held by party a to put a stake $\gamma - \gamma^r$ to party b at 'fair' value, or a call option held by party b to call a stake $\gamma - \gamma^r$ from party a at fair value, serves to change the parties' stakes from $(\gamma, 1-\gamma)$ to $(\gamma^r, 1-\gamma^r)$ while maintaining the parties' shares of the payoff in the desired proportions γ 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, only that it be unbiased.

Here, we show in Proposition 3 that fair value is equal to $V_{ab}(I, T^r, s_{ab})$ given ex ante investment I, and we show that put and call options can be tailored as a mechanism that generates an allocation $(\gamma^r, 1-\gamma^r)$ ex post and $(\gamma, 1-\gamma)$ ex ante.

Proposition 3 *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 γ and $1-\gamma$. It therefore maintains the parties' incentives for ex ante investments. Nonetheless, by changing the parties' stakes from $(\gamma, 1-\gamma)$ to $(\gamma^r, 1-\gamma^r)$ 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

$$\begin{aligned} & \gamma V_{ab}\left(I, T^r, s_{ab}\right) + \alpha_a B\left(t_a^r\right) \\ > \; & \gamma V_{ab}\left(I, T, s_{ab}\right) + \alpha_a B\left(t_a\right) \\ & +\beta \left[\begin{array}{c} V_{ab}\left(I, T^r, s_{ab}\right) + \alpha_a B\left(t_a^r\right) + \alpha_b B\left(t_b^r\right) \\ - \left[V_{ab}\left(I, T, s_{ab}\right) + \alpha_a B\left(t_a\right) + \alpha_b B\left(t_b\right)\right] \end{array} \right] \end{aligned} \tag{3}$$

where β denotes party a's bargaining power. But inequality (3) implies that

$$\begin{aligned} & (1-\gamma) V_{ab}\left(I, T^r, s_{ab}\right) + \alpha_b B\left(t_b^r\right) \\ < \; & (1-\gamma) V_{ab}\left(I, T, s_{ab}\right) + \alpha_b B\left(t_b\right) \\ & +(1-\beta) \left[\begin{array}{c} V_{ab}\left(I, T^r, s_{ab}\right) + \alpha_a B\left(t_a^r\right) + \alpha_b B\left(t_b^r\right) \\ - \left[V_{ab}\left(I, T, s_{ab}\right) + \alpha_a B\left(t_a\right) + \alpha_b B\left(t_b\right)\right] \end{array} \right] \end{aligned}$$

Thus, a put option will be granted party a when inequality (3) is true, and a call option will be granted party b when it is false.[6]

The preceding reasoning extends to the case where there exist two additional states s_a and s_b

[6] 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

$$\begin{aligned} & (\gamma - \beta) V_{ab}\left(I, T^r, s_{ab}\right) + (1-\beta)\alpha_a B\left(t_a^r\right) - \beta\alpha_b B\left(t_b^r\right) \\ < \; & (\gamma - \beta) V_{ab}\left(I, T, s_{ab}\right) + (1-\beta)\alpha_a B\left(t_a\right) - \beta\alpha_b B\left(t_b\right) \end{aligned}$$

But the preceding inequality is false. To see this, note that the results $\frac{\partial t_a^r}{\partial \gamma^r} < 0$, $\frac{\partial t_b^r}{\partial \gamma^r} > 0$, and $\frac{\partial t_a^r}{\partial \gamma^r} + \frac{\partial t_b^r}{\partial \gamma^r} > 0$ when $\alpha_a > \alpha_b$ from the proof of Proposition 1 and the assumption $\gamma > \gamma^r$ imply $t_a^r > t_a$, $t_b^r < t_b$, 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.

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

$$\begin{aligned} \gamma V_a(I,0,s_a) \quad &> \quad \gamma V_{ab}(I,T,s_a) + \alpha_a B(t_a) \\ &\quad +\beta \begin{bmatrix} V_a(I,0,s_a) \\ -\left[V_{ab}(I,T,s_a) + \alpha_a B(t_a) + \alpha_b B(t_b)\right] \end{bmatrix} \end{aligned}$$

is true or false, where V_a denotes the value of the venture when used by party a alone. It may also be the case that even in the state where the partners should keep a stake absent transfers, the value of the venture under the complete ownership of one partner dominates joint ownership with transfer T_r. In this case, put and call options on the entirety of the stake of one of the partner is desirable.

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.

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.[7]

To motivate the use of pre-emption rights, assume there exists a trade buyer tb who cannot increase the value of the venture but can extract more value from the venture than can party a for

[7] 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.

example. Specifically, assume[8]

$$\begin{aligned} & V_{tb}\left(I,0,s_{ab}\right) \\ < \quad & V_{ab}\left(I,t_a+t_b^{ab},s_{ab}\right)+\alpha_a B\left(t_a\right)+\alpha_b B\left(t_b^{ab}\right) \end{aligned} \tag{4}$$

but

$$\begin{aligned} & \gamma V_{tb}\left(I,t_{tb}+t_b^{tb},s_{ab}\right)+\alpha_{tb} B\left(t_{tb}\right) \\ > \quad & \gamma V_{ab}\left(I,t_a+t_b^{ab},s_{ab}\right)+\alpha_a B\left(t_a\right) \end{aligned} \tag{5}$$

where $t_b^{tb} \equiv \arg\max_{\widehat{t}_b} (1-\gamma) V_{tb}\left(I,t_{tb}+\widehat{t}_b,s_{ab}\right)+\alpha_b B\left(\widehat{t}_b\right)$ and t_b^{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 ($\alpha_{tb} > \alpha_a$).[9]

Inequalities (4) and (5) imply that

$$\begin{aligned} & (1-\gamma) V_{tb}\left(I,t_{tb}+t_b^{tb},s_{ab}\right)+\alpha_b B\left(t_b^{tb}\right) \\ < \quad & (1-\gamma) V_{ab}\left(I,t_a+t_b^{ab},s_{ab}\right)+\alpha_b B\left(t_b^{ab}\right) \end{aligned} \tag{6}$$

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 it 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

[8] In order to simplify the exposition, we assume that $\gamma = \gamma^r$ in the present section. This is without loss of generality.

[9] The result $\frac{\partial t_a}{\partial \alpha_a} > 0$, which can be derived from equations (15) and (16) in the proof of Proposition 1, implies that $t_{tb} > t_a$ for $\alpha_{tb} > \alpha_a$.

his stake to the trade buyer in state s_{ab} under the sufficient condition that

$$\begin{aligned} & \gamma V_b\left(I, 0, s_{ab}\right) \\ & +\beta\left[V_{ab}\left(I, t_a+t_b^{ab}, s_{ab}\right)+\alpha_a B\left(t_a\right)+\alpha_b B\left(t_b^{ab}\right)-V_b\left(I, 0, s_{ab}\right)\right] \\ < \quad & \gamma V_{ab}\left(I, t_a+t_b^{ab}, s_{ab}\right)+\alpha_a B\left(t_a\right) \end{aligned} \tag{7}$$

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 4 *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.*

Proof: See Appendix 2.■

Tag-along rights, which allow party b to require the trade buyer to buy b's stake on the same terms and conditions as party a's stake, may serve the same role as pre-emption rights. Tag-along rights deny the trade buyer the incentive to engage in transfers, as such rights make the trade buyer's acquisition of the venture conditional on him being the single owner of the venture. They therefore decrease the price he can offer for party a's stake and thereby diminish the credibility of party a's threat to sell his stake to the trade buyer.

Proposition 5 *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.■

Here, pre-emption rights and tag-along rights are redundant. However, since the exercise of pre-emption rights is based on fair value and the exercise of tag-along rights is based on price, these

may be complementary when valuation is costly or imperfect[10].

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.

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 may profit by vetoing the sale of the venture. This problem arises when this party is worse off with the sale unless bargaining between the parties takes place, as the other party tries to buy the vetoing party's assent to the value-increasing sale.[11] This problem arises when

$$\begin{aligned} & \gamma V_{tb}\left(I,0,s_{tb}\right) \\ < \quad & \gamma V_{ab}\left(I,T,s_{tb}\right)+\alpha_a B\left(t_a\right) \\ & +\beta\left[V_{tb}\left(I,0,s_{tb}\right)-\left[V_{ab}\left(I,T,s_{tb}\right)+\alpha_a B\left(t_a\right)+\alpha_b B\left(t_b\right)\right]\right] \end{aligned} \tag{8}$$

[10] Our analysis of pre-emption rights and tag-along rights applies to the special case where the trade buyer is tempted to collude with one partner at the expense of the other. In addition, although we have taken this out of the formal analysis, these two clauses may also serve to prevent the trade buyer from making both buyers compete in Bertrand fashion to sell their stakes and let the trade buyer transfer wealth at the expense of the remaining partner. This would, of course, allow the buyer to extract wealth at the expense of both partners, and would lead to underinvestment.

[11] Shareholder agreements specify a restriction in the transfer of shares before specifying the clauses that relax this restriction.

or

$$\begin{aligned} & (1-\gamma) V_{tb}(I, 0, s_{tb}) \\ < \; & (1-\gamma) V_{ab}(I, T, s_{tb}) + \alpha_b B(t_b) \\ & + (1-\beta)\left[V_{tb}(I, 0, s_{tb}) - \left[V_{ab}(I, T, s_{tb}) + \alpha_a B(t_a) + \alpha_b B(t_b)\right]\right] \end{aligned} \tag{9}$$

The two inequalities cannot simultaneously be true, as the sum of their LHS equals that of their RHS. But one of them will hold, and one party will then 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

$$\begin{aligned} & \gamma V_{tb}(I, t_a, s_{tb}) + \alpha_a B(t_a) \\ & + \left[V_{tb}(I, 0, s_{tb}) - \left[V_{tb}(I, t_a, s_{tb}) + \alpha_a B(t_a)\right]\right] \\ = \; & V_{tb}(I, 0, s_{tb}) - (1-\gamma) V_{tb}(I, t_a, s_{tb}) \\ > \; & V_{tb}(I, 0, s_{tb}) - (1-\gamma) V_{tb}(I, 0, s_{tb}) \\ = \; & \gamma V_{tb}(I, 0, s_{tb}) \end{aligned} \tag{10}$$

for party a, and

$$\begin{aligned} & (1-\gamma) V_{tb}(I,0,s_{tb}) \\ & + [V_{tb}(I,0,s_{tb}) - V_{tb}(I,0,s_{tb})] \\ = \quad & (1-\gamma) V_{tb}(I,0,s_{tb}) \end{aligned}$$

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

$$\begin{aligned} & V_{tb}(I,0,s_{tb}) - \left[\begin{array}{c} \gamma V_{tb}(I,t_a,s_{tb}) + \alpha_a B(t_a) \\ + [V_{tb}(I,0,s_{tb}) - [V_{tb}(I,t_a,s_{tb}) + \alpha_a B(t_a)]] \end{array} \right] \\ < \quad & V_{tb}(I,0,s_{tb}) - \gamma V_{tb}(I,0,s_{tb}) \\ = \quad & (1-\gamma) V_{tb}(I,0,s_{tb}) \end{aligned}$$

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 6 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 6 *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.[12] 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 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.[13]

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[14]

$$\gamma V_{tb}\left(I, t_{tb} + t_b^{tb}, s_{tb}\right) + \alpha_{tb} B\left(t_{tb}\right) > \gamma V_{tb}\left(I, 0, s_{tb}\right) \tag{11}$$

It is clear that party a would like to conspire with the trade buyer to have the trade buyer buy

[12] This can be formalized by introducing a use $u = ipo$ and a state s_{ipo} that are analogous to $u = tb$ and s_{tb}.

[13] For example, stock exchanges require companies to abide by 'Continuing Obligations' that are aimed at protecting outside shareholders.

[14] A sufficient condition for inequality (11) to hold is that $\alpha_b = 0$. This implies that $t_b^{tb} = 0$ and reduces inequality (11) to

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

The preceding inequality is true from the assumption that transfers do occur when the venture has more than a single owner.

a's stake at the price $\gamma V_{tb}\left(I, t_{tb}+t_b^{tb}, s_{tb}\right)+\alpha_{tb}B\left(t_{tb}\right)$. Party a's payoff would then be greater than the payoff $\gamma V_{tb}\left(I,0,s_{tb}\right)$ 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 for the latter to buy the former's stake is

$$\begin{aligned}
& (1-\gamma) V_{tb}\left(I, t_{tb}+t_b^{tb}, s_{tb}\right)+\alpha_b B\left(t_b^{tb}\right) \\
& +\left[V_{tb}\left(I,0,s_{tb}\right)-\left[V_{tb}\left(I, t_{tb}+t_b^{tb}, s_{tb}\right)+\alpha_{tb}B\left(t_{tb}\right)+\alpha_b B\left(t_b^{tb}\right)\right]\right] \\
= \; & V_{tb}\left(I,0,s_{tb}\right)-\left[\gamma V_{tb}\left(I, t_{tb}+t_b^{tb}, s_{tb}\right)+\alpha_{tb}B\left(t_{tb}\right)\right] \\
< \; & V_{tb}\left(I,0,s_{tb}\right)-\left[\gamma V_{tb}\left(I,0,s_{tb}\right)\right] \qquad (12) \\
= \; & (1-\gamma) V_{tb}\left(I,0,s_{tb}\right)
\end{aligned}$$

where the inequality is true from inequality (11). The founding parties' payoffs are thereby altered from the original proportions γ and $1-\gamma$. We show in Proposition 7 that tag-along rights granted party b serve to maintain the parties' payoffs in these proportions.

Proposition 7 *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 $\gamma V_{tb}\left(I,0,s_{tb}\right)$ and $(1-\gamma) V_{tb}\left(I,0,s_{tb}\right)$. 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

$$\gamma V_b\left(I,0,s_{tb}\right)+\beta\left[V_{tb}\left(I,0,s_{tb}\right)-V_b\left(I,0,s_{tb}\right)\right]<\gamma V_{tb}\left(I,0,s_{tb}\right) \tag{13}$$

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 right is lower than a's payoff from a straightforward trade sale. If the reverse inequality holds, then pre-emption rights fail to do so.

An implication of our model is that drag-along rights should come together with pre-emption rights. This is because drag-along rights may increase the rightholder's incentive to conspire with the trade buyer at the expense of the other party. In particular, one partner may be tempted to sell his stake to a trade buyer at a low price, exercise the drag-along right to force the other partner to sell his stake at the same low price, and then obtain a side payment from the trade buyer. Pre-emption rights prohibit such a strategy, since they allow the other party to buy out the whole venture, and maybe to sell it to the trade buyer.

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 γ 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 γ and $1-\gamma$ in both states s_{ab} and s_{tb} and under a wide range of circumstances. As a result, following Proposition 2, the only restriction in investments will come from the minimum transfer level T_r in state s_{ab}.

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.[15]

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.

[15] Formally, our definition of different states can be viewed as encompassing both return and control rights. This interpretation implies that clauses elicit an efficient, state-contingent allocation of control. In particular, state s_{ab} can be interpreted as a state of joint control

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 $\gamma V_c(i_a i_b, s_c)$. 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

$$\begin{aligned} & \gamma V_t(I,s_c) + \beta\left[V_c(I,s_c) - V_t(I,s_c)\right] \\ = \;& \beta V_c(I,s_c) - (\beta-\gamma) V_t(I,s_c) \\ > \;& \gamma V_c(I,s_c) \end{aligned}$$

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

$$\begin{aligned} & (1-\gamma) V_c(I, s_t) + (1-\beta)\left[V_t(I, s_t) - V_c(I, s_t)\right] \\ = \; & (1-\beta) V_t(I, s_t) + (\beta-\gamma) V_c(I, s_t) \\ < \; & (1-\gamma) V_t(I, s_t) \end{aligned}$$

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

6 Further Issues

6.1 Contracting Issues and Renegotiation

The analysis of Sections 3 and 4 has revolved around the idea that clauses are used to do better than renegotiation and to limit the scope of renegotiation. Yet, renegotiation often occurs in practice (Lerner and Tsai, 2000). We ascribe such renegotiation to three factors. 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 γ 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.

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 partner has better knowledge of the value of the venture to himself than does the other. 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.

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.[16] The problem caused by conflicting clauses may be mitigated by assigning precedence in the exercise of the clauses, or by omitting some clauses (Linklaters et al., 1990, p. 61).[17] It is unlikely to be eliminated entirely. As a result, renegotiation may occur.

We acknowledge the importance of the preceding considerations 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

For simplicity, most of our analysis has assumed that fair valuation was reached through a costless and efficient mechanism. However, the valuation of privately held firms is often difficult and imperfect. For instance, a number of authors have attempted to estimate the risk and return of venture capital (cf Cochrane, 2001, for a short survey and as one example of such attempts). Such valuation issues challenge most existing solutions to moral hazard in teams. For instance, Holmström's (1982) suggested solution to solve moral hazard problems in teams by breaking budget constraints would require a costless and efficient valuation technology. In contrast, rights of first refusal, drag-along rights, and tag-along rights do not require an efficient and verifiable valuation.

Furthermore, the firm's valuation depends on the clauses found in shareholder agreements. We have shown that these clauses affect investment and, hence, valuation to the existing partners and

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

[17] 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 $(\gamma^r, 1-\gamma^r)$, 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)).

potential buyers. In many cases, however, the disclosure of these clauses to potential trade buyers is not guaranteed. A trade buyer's information and/or expectations about the clauses that are included in shareholder agreements affect the probability of being in state s_{tb} and the valuation to the trade buyer.

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.[18] For example, tag-along rights recall the mandatory bid rule, which 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 to 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

[18] See for example Bebchuk (1994), Easterbrook and Fischel (1991), and Romano (1992).

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 (Easterbrook and Fischel, 1991). 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.

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 γ^r is the solution to the problem

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

where

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

and

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

The corresponding first-order conditions are

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

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

and

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

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

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

and

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

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

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

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

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 Leontieff production function $\min\left[i_a, i_b\right]$. We therefore rewrite problem (1) as

$$\underset{\widehat{I}}{Max}\ p_{ab}V_{ab}\left(\widehat{I}, 0, s_{ab}\right) + p_{tb}V_{tb}\left(\widehat{I}, 0, s_{tb}\right) - \frac{1}{2}\left(c_a + c_b\right)\widehat{I}^2$$

The preceding problem has first-order condition

$$p_{ab}V_{ab,1}\left(I^{FB}, 0, s_{ab}\right) + p_{tb,1}V_{tb}\left(I^{FB}, 0, s_{tb}\right) - \left(c_a + c_b\right)I^{FB} = 0$$

$$\Leftrightarrow I^{FB} = \frac{p_{ab}V_{ab,1}\left(I^{FB}, 0, s_{ab}\right) + p_{tb}V_{tb,1}\left(I^{FB}, 0, s_{tb}\right)}{c_a + c_b} \blacksquare$$

Given that the derivation of the partners' program is not affected when taking transfer T_r as a

parameter, we keep T_r in the equations. We write the problems solved by parties a and b as follows

$$\underset{\widehat{i}_a}{Max}\ p_{ab}\left[\gamma V_{ab}\left(\min\left[\widehat{i}_a, i_b\right], T^r, s_{ab}\right) + \alpha_a B\left(t_a^r\right)\right] + p_{tb}\gamma V_{tb}\left(\min\left[\widehat{i}_a, i_b\right], 0, s_{tb}\right) - \frac{1}{2}c_a\widehat{i}_a^2$$

and

$$\underset{\widehat{i}_b}{Max}\ p_{ab}\left[(1-\gamma) V_{ab}\left(\min\left[i_a, \widehat{i}_b\right], T^r, s_{ab}\right) + \alpha_b B\left(t_b^r\right)\right] + p_{tb}(1-\gamma) V_{tb}\left(\min\left[i_a, \widehat{i}_b\right], 0, s_{tb}\right) - \frac{1}{2}c_b\widehat{i}_b^2$$

These have first-order conditions

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

and

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

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

Proof of Proposition 3: Consider the case where party a has been granted a put option at fair value on the stake $\gamma - \gamma^r$.[19] 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

$$\begin{aligned} & \underset{\widehat{t}_a}{Max}\ \gamma V_{ab}\left(I, \widehat{t}_a + t_b, s_{ab}\right) + \left[-(\gamma - \gamma^r) V_{ab}\left(I, \widehat{t}_a + t_b, s_{ab}\right) + (\gamma - \gamma^r) F\right] + \alpha_a B\left(\widehat{t}_a\right) \\ = \quad & \underset{\widehat{t}_a}{Max}\ \gamma^r V_{ab}\left(I, \widehat{t}_a + t_b, s_{ab}\right) + (\gamma - \gamma^r) F + \alpha_a B\left(\widehat{t}_a\right) \end{aligned}$$

[19] The case where party b has been granted a call option is similar.

and

$$\underset{\widehat{t}_b}{Max}\ (1-\gamma^r)\,V_{ab}\left(I,t_a+\widehat{t}_b,s_{ab}\right)-(\gamma-\gamma^r)\,F+\alpha_b B\left(\widehat{t}_b\right)$$

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 $V_{ab}\left(I,T^r,s_{ab}\right)$. The strike price equals $(\gamma-\gamma^r)\,V_{ab}\left(I,T^r,s_{ab}\right)$, 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

$$\begin{aligned}
& \gamma^r V_{ab}\left(I,T^r,s_{ab}\right)+(\gamma-\gamma^r)\,F+\alpha_a B\left(t_a^r\right)\\
= \ & \gamma^r V_{ab}\left(I,T^r,s_{ab}\right)+(\gamma-\gamma^r)\,V_{ab}\left(I,T^r,s_{ab}\right)+\alpha_a B\left(t_a^r\right)\\
= \ & \gamma V_{ab}\left(I,T^r,s_{ab}\right)+\alpha_a B\left(t_a^r\right)
\end{aligned}$$

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

Proof of Proposition 4: 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

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

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

party a is

$$\begin{aligned}
& (1-\gamma) V_{tb}\left(I, t_{tb}+t_b^{tb}, s_{ab}\right)+\alpha_b B\left(t_b^{tb}\right) \\
& +(1-\beta)\left[\begin{array}{c} V_{ab}\left(I, t_a+t_b^{ab}, s_{ab}\right)+\alpha_a B\left(t_a\right)+\alpha_b B\left(t_b^{ab}\right) \\ -\left[V_{tb}\left(I, t_{tb}+t_b^{tb}, s_{ab}\right)+\alpha_{tb} B\left(t_{tb}\right)+\alpha_b B\left(t_b^{tb}\right)\right] \end{array}\right] \\
< & (1-\gamma) V_{tb}\left(I, t_{tb}+t_b^{tb}, s_{ab}\right)+\alpha_b B\left(t_b^{tb}\right) \\
& +\left[\begin{array}{c} V_{ab}\left(I, t_a+t_b^{ab}, s_{ab}\right)+\alpha_a B\left(t_a\right)+\alpha_b B\left(t_b^{ab}\right) \\ -\left[V_{tb}\left(I, t_{tb}+t_b^{tb}, s_{ab}\right)+\alpha_{tb} B\left(t_{tb}\right)+\alpha_b B\left(t_b^{tb}\right)\right] \end{array}\right] \\
= & V_{ab}\left(I, t_a+t_b^{ab}, s_{ab}\right)+\alpha_a B\left(t_a\right)+\alpha_b B\left(t_b^{ab}\right) \\
& -\left[\gamma V_{tb}\left(I, t_{tb}+t_b^{tb}, s_{ab}\right)+\alpha_{tb} B\left(t_{tb}\right)\right] \\
< & V_{ab}\left(I, t_a+t_b^{ab}, s_{ab}\right)+\alpha_a B\left(t_a\right)+\alpha_b B\left(t_b^{ab}\right) \\
& -\left[\gamma V_{ab}\left(I, t_a+t_b^{ab}, s_{ab}\right)+\alpha_a B\left(t_a\right)\right] \\
= & (1-\gamma) V_{ab}\left(I, t_a+t_b^{ab}, s_{ab}\right)+\alpha_b B\left(t_b^{ab}\right)
\end{aligned}$$

where the second inequality is true by inequality (5).■

Proof of Proposition 5: Let P denote the price that the trade buyer would pay for the venture. This price must be such that

$$\gamma P > \gamma V_{ab}\left(I, t_a+t_b^{ab}, s_{ab}\right)+\alpha_a B\left(t_a\right) \tag{17}$$

and

$$P \leqslant V_{tb}\left(I, 0, s_{ab}\right) \tag{18}$$

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

$$\begin{aligned} & V_{ab}\left(I, t_a + t_b^{ab}, s_{ab}\right) + \frac{\alpha_a}{\gamma} B\left(t_a\right) \\ < \quad & V_{ab}\left(I, t_a + t_b^{ab}, s_{ab}\right) + \alpha_a B\left(t_a\right) + \alpha_b B\left(t_b^{ab}\right) \end{aligned}$$

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

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