ASSET OWNERSHIP AND IMPLICIT CONTRACTS*

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Abstract

In a setting with two managers/owners who both make relation- and asset-specific investments, I suggest a model where a linear implicit contract can strengthen the incentives to invest, if the parties are sufficiently patient. Otherwise, only asset ownership can be used to influence the incentives. First, I analyse the case where the implicit contract may include a fixed transfer, which then must be paid by the manager with the weakest bargaining position. I argue that this arrangement is not observed in business relations, due to risk aversion, bounded rationality and social norms. Therefore I focus on implicit contracts without fixed transfers in the rest of the paper. The same ownership structure is then optimal under both spot governance and implicit contracting, unless an ownership structure with more symmetrical bargaining positions can support a better implicit contract. In fact, a first-best implicit contract is self-enforcing only when the two managers enjoy similar bargaining positions, even if they are infinitely patient. Choosing between technologies, strong interdependencies can be good, since the future losses associated with an implicit contract violation then are large.

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1. Introduction

Williamson (1975, 1985) and Klein, Crawford and Alchian (1978) observed that specific investments can play an important role to determine optimal asset ownership. Building on this idea, Grossman and Hart (1986), Hart and Moore (1990) and Hart (1995) suggest formal models to show the benefits and costs of integration with respect to the hold-up problem. These models are limited to one-period relationships. I am aware of only two working papers that treat the multi-period case, where reputation effects can play an important role.[1]

Halonen (1994) argues that ownership rights matter also in a long-term relationship, where the parties are disciplined by reputation effects. In a model where (for some unexplained reason) no transfer of ownership can take place after one of the parties has cheated, the worst ownership structure of the one-shot game is good in the repeated setting because it provides strong punishment but bad because the gains from deviation also are large. The optimal ownership structure can change from the one-shot game to the repeated setting.

Baker, Gibbons and Murphy (1996) analyse the case where only one of the parties invests. They distinguish between spot employment, firms, spot markets and relational contracts, and allow for a transfer of ownership rights if cooperation breaks down. The results add to the argument by Coase (1937) that firms can arise only when markets perform sufficiently poorly, as there must be enough surplus from engaging in an implicit contract that the temptation to renege in one period is offset by the fear of future economic losses.

This paper is an attempt to further deepen our insights with respect to optimal ownership structures and implicit contracts (which can be interpreted as a kind of trust). In the spirit of the Grossman-Hart-Moore models I focus on a situation where both parties make relation- and asset-specific investments. Then the model predictions become more realistic, for instance with respect to when firms should dominate relational contracting.

First, I introduce a general framework for two assets and two managers/owners, where *ownership rights* and *implicit contracts* can govern transactions. In an accompanying paper (Bragelien 1998) I discuss how *explicit contracts* and ownership rights are jointly determined by the parties' risk aversion and the specificity of their investments in a one-period setting. Together these two papers reflect Bradach and Eccles' (1989) observation that price, authority and trust mechanisms are found both in markets and in firms.

[1] Another interesting discussion of reputation effects with respect to the theory of the firm is found in Kreps (1990). He considers a situation with one employer (owner) and many (risk averse) employees. Unforeseen contingencies render long-term complete contracts impossible. Instead the employer is given the authority to decide on adaptations as time goes by and the environment changes. Then the employees must have some kind of faith or trust in the fact that the authority will be used fairly. As unforeseen contingencies tend to follow patterns, the employer can build up a reputation for meeting the contingencies in a certain way. Kreps argues that a corporate culture is partly characterised by the principles that govern such decision making and partly by the means by which the principles are communicated.

Then I develop the one-period model. I assume risk neutrality, linearity, independent technologies and quadratic cost functions to neutralise all effects except for a simple version of the hold-up problem found in Hart (1995). The basic model is a variation of the one I use in Bragelien (1998) and is inspired by Holmstrom and Milgrom's (1991) linear moral hazard model. It is very different from the models by Halonen and Baker, Gibbons and Murphy, especially in the way uncertainty and investment specificity is modelled.

In section 4 I introduce an implicit contract that is linear in the observable, but not verifiable benefits of the two parties. Following Baker, Gibbons and Murphy (1996) I assume that a spot relationship prevails forever after an implicit contract violation, but that a transfer of ownership rights can take place. I focus on self-enforcing implicit contracts, which in fact are expected never to be broken.

First, in section 5, I analyse the case where the implicit contract may include a fixed transfer. The manager with the weakest bargaining position would then have to commit to a fixed payment in every period. However, in actual business relations, payments typically go the other way and are part of a verifiable contract. The absence of fixed transfers in implicit contracts can be explained by risk aversion, bounded rationality and social norms.

In section 6 I therefore focus on implicit contracts without fixed transfers. I show that the manager with the strongest bargaining position will enjoy the strongest incentives under both spot governance and implicit contracting. If the managers are sufficiently patient, a self-enforcing implicit contract always exists that is better than the spot governance relationship. However, first-best is not always sustainable, even when the discount rate goes to zero. A first-best implicit contract can be self-enforcing only if the two managers enjoy relatively similar bargaining positions. In other words, with this class of implicit contracts, symmetry can be good for the implicit contract, and ownership matters even when the parties are infinitely patient (since the bargaining positions are determined by the ownership structure).

Choosing between ownership structures, an implicit contract benefits from strong bargaining positions, since the temptation to renege then is small. Strong bargaining positions are good also under spot governance. The managers should therefore choose the same ownership structure under both governance modes, unless another ownership structure with more symmetrical bargaining positions can sustain a better implicit contract. Choosing between technologies, weak bargaining positions are good for the implicit contract under some circumstances, since the future losses associated with an implicit contract violation then are large. Stronger interdependencies can thus be beneficial for a business relation, even if it does not lead to higher returns on investments.

In section 7 I suggest some more structure with respect to the investment specificity technology. This is helpful to illustrate some well-known results in the spot governance mode from Hart and Moore (1990) and Hart (1995). Then I use this investment specificity structure in section 8 to show how the optimal governance structure is jointly determined by the discount rate and the relative investment specificity of the two managers in a specific example. I do this exercise both for one and two assets. The example demonstrates, for example, that partnerships are likely to occur in settings where the two parties have similar technologies, they take a long-term perspective and there is for all practical purposes only one asset to own (e.g. the company name). These conditions seem to be satisfied for many law and management consulting firms, where partnerships are prevalent.

Finally, in section 9 I discuss the model and some of the results in a wider context. I argue that the model seems realistic from a bounded rationality perspective, and that it does capture mechanisms and trade-offs that are important also under more complex technologies.

2. A general framework

In this section I suggest a general governance framework for two assets and two productive managers/owners. Both make unobservable asset- and relationship-specific investments. When uncertainty is resolved, the two managers make some further non-contractible decisions (e.g. to trade a particular good) influencing the actual outcome. It is impossible (or too costly) to ex-ante contract on the ex-post decision, due to the high degree of uncertainty. This cycle of ex-ante investments and ex-post decisions and outcomes is repeated in future periods.

A classical interpretation of the model would be that manager 2 in combination with asset 2 supplies an input to manager 1, who with asset 1 uses this input to produce output that is sold on the output market (Hart 1995). The investments may stand for expenditures of money or time in making the manufacturing operations more effective and developing the output market respectively. An *asset* could for instance be a factory, a distribution network or a company name, and a *manager* could include the whole management team.

There are two instruments available to influence the incentives to invest. The two parties can choose a specific ownership structure, in the sense that ownership gives the owner(s) residual control rights (Grossman and Hart 1986). And, they can agree to an implicit contract on observable benefits. The benefits are not verifiable, so a contract cannot be enforced by a third party, but in a repeated setting reputation effects may discipline the managers.

Reputation effects work only if the managers are sufficiently patient. Otherwise they must rely on *spot governance*, where the parties worry only about the current period when they make decisions. If that is the situation, assume that renegotiations always lead to efficient ex-post decisions, regardless of ex-ante investment levels and ownership structure. The negotiated monetary transfer depends on the parties' bargaining positions. The ownership rights will influence these bargaining positions, since the value of a manager's outside option is affected. A manager's investment level will thus reflect her marginal benefits after the anticipated renegotiation process.

Define asset ownership as the right to deny other parties access to the asset (Hart and Moore 1990). In that case there are five distinct ownership structures. Either manager 1 owns both assets (which, following Hart (1995), I call *Type 1 integration* - *T1*), manager 2 owns both assets *(Type 2 integration - T2)*, each manager owns the asset most specific to her investments *(Non-integration - NI)*, each manager owns the asset most specific to the other manager's investments *(Cross ownership - CO)*, or, finally, the two managers jointly own the two assets *(Joint ownership - JO)*. Under joint ownership both parties must agree for any of them to have access to the asset. In other words, both have a form of veto power.

Then there are altogether ten different categories of governance. These are summarised in figure 1 below, where I also name the categories.[2]

Contracting mode	***Ownership structure***				
	T1	T2	NI	CO	JO
Spot governance	Spot Employment I	Spot Employment II	Spot Market		
Implicit contracts	Firm I	Firm II	Relational Contracting	Mutual hostage taking	Partnership

Figure 1

Under *spot employment* one of the managers owns both assets, and in each period she offers the other party a contract which is unaffected by the past. *Firms* are characterised by the same ownership structure, but the parties are to some extent disciplined by reputation effects. Under non-integration I call the categories *spot market* and *relational contracting*. While cross ownership and joint ownership structures in the implicit contracting mode are called *mutual hostage taking* and *partnerships* respectively.

As the reader will see when I define the formal model, joint ownership and cross ownership are dominated by non-integration in the spot governance mode, and these categories are therefore crossed out. However, joint ownership and cross ownership can be viable in an implicit contract mode.

[2] The figure is inspired by the framework for one asset and one-sided investments found in Baker, Gibbons and Murphy (1996). Note that the categories I call Spot Employment II and Firm II are comparable to the categories they choose to call Spot Market and Relational Contract respectively.

Non-integration and cross ownership are not relevant if there is only one asset. If there are more than two assets, more ownership structures will be available to the parties. In this model, ownership is only important in the sense that it decides the parties' relative bargaining positions. The more assets there are (that are specific to investments), the more flexibility the parties have in finding jointly favourable bargaining positions.

3. The basic one-period model

There are two assets and two productive risk-neutral parties, manager 1 and manager 2. At t = 0 the parties make non-observable investments in human capital (e_1 and e_2).

The benefits at t = 1 for the two managers are observable to manager 1 and 2 but not verifiable to a third party.[3] The benefits depend on the investments at t = 0, some stochastic variables and on whether the two parties choose to cooperate or not at t = 1. In the case of no cooperation, the benefits will further depend on the ownership structure. The outside option is worth more to a manager if she has access to some of (or preferably all) the assets. Whether cooperation has taken place or not is also observable to the two parties but not verifiable to outsiders.

Assume independent technologies that are linear in an agent's effort e_j ($j \in \{1,2\}$). If they choose to cooperate, the two managers' value added (net of t = 1 costs) are given by

$$\theta_1^C = e_1 + \varepsilon_1$$

$$\theta_2^C = e_2 + \varepsilon_2$$

where $e_j \geq 0$, $E[\varepsilon_j] = 0$ and $\varepsilon_j \in [-\varepsilon, \varepsilon]$.[4] In the more general case, θ_j^C could be a function of both e_1 and e_2. However, the independent technology property is not necessarily unrealistic. Say that manager 2's manufacturing costs decide θ_2^C (after investing in production competencies), and that the price manager 1 can take for the product in the end market decides θ_1^C (after marketing investments). There is no reason to believe that marketing investments should influence production costs and that (firm-specific) production technology investments (that are unobservable to the buyers) should influence the price in the output market. Note that I do not rule out correlation between ε_1 and ε_2.

If, however, the two parties choose not to cooperate, their benefits are reduced to

[3] Note that benefits (and costs) can be monetary in nature even if they are not verifiable to third parties.

[4] The assumption that investment levels and the stochastic variables enter the benefit functions additively is inspired by Holmstrom and Milgrom (1991). Alternatively we could let the range of ε_j depend on e_j, for instance so that $\varepsilon_j \in [-e_j, e_j]$. The results of this paper would still hold qualitatively, and in fact the self-sustaining constraints (in section 4) would then be simplified.

$$\theta_1^{NC} \equiv \gamma_k \theta_1^C$$
$$\theta_2^{NC} \equiv \lambda_k \theta_2^C$$

where γ_k, $\lambda_k \in [0,1)$ are constants that depend on the ownership structure $k \in K \equiv \{T1, T2, NI, CO, JO\}$. This assumption is strong in the sense that total and marginal benefits move together. That does not necessarily need to be the case, but it is consistent with Hart and Moore (1990) and Hart (1995).[5] Further, the assumption is strong in the sense that the nature of the uncertain variables is the same both under cooperation and non-cooperation.

As is becoming standard in the literature, assume a symmetric Nash bargaining solution at t = 1. That is, cooperation takes place after renegotiations, and the gains are split 50:50. The risk neutral managers then maximise

$$U_1 = ½\, E\, [\, \theta_1^C + \theta_1^{NC} + \theta_2^C - \theta_2^{NC}\,] - c_1(e_1)$$
$$U_2 = ½\, E\, [\, \theta_1^C - \theta_1^{NC} + \theta_2^C + \theta_2^{NC}] - c_2(e_2)$$

where $c_j(e_j)$ denotes manager j's private costs at t = 0 (in t = 1 dollars). To simplify the analysis, assume quadratic cost functions

$$c_j\,(e_j) = ½\, e_j^2\,, \quad j \in \{1, 2\}.$$[6]

Define $\varphi_k \equiv ½(1+\gamma_k)$ and $\psi_k \equiv ½(1+\lambda_k)$, which can be interpreted as the parties' respective *bargaining positions* (which must not be confused with the parties' bargaining *power* in a Nash bargaining sense). The maximisation problems of the two managers for a given ownership structure k then simplify to

$$e_1^k = \underset{e_1}{\text{Argmax}}\, U_1 = \underset{e_1}{\text{Argmax}}\, \{\, \varphi_k e_1 + (1-\psi_k)\, e_2 - ½\, e_1^2 \,\} = \varphi_k$$
$$e_2^k = \underset{e_2}{\text{Argmax}}\, U_2 = \underset{e_2}{\text{Argmax}}\, \{\, (1-\varphi_k)\, e_1 + \psi_k\, e_2 - ½\, e_2^2 \,\} = \psi_k$$

Note that first-best investment levels are $e_1^* = e_2^* = 1$, so the managers always underinvest in the spot governance mode. They should choose the ownership structure (determining specific values of φ_k and ψ_k) that maximises the expected joint surplus

$$\Omega_k\, (\varphi_k,\psi_k) = e_1(\varphi_k) + e_2(\psi_k) - c_1(e_1(\varphi_k)) - c_2(e_2(\psi_k))$$
$$= \varphi_k + \psi_k - ½\, \varphi_k^2 - ½\, \psi_k^2$$

[5] Baker, Gibbons and Murphy (1996) assume a different kind of technology, where total and marginal benefits do not move together. Hence, in their model over-investment is possible, while in my model the parties always underinvest in the spot governance mode (although one of the managers may over-invest under an implicit contract).

[6] Most of the results in this paper are robust with respect to the form of the cost function. A notable exception is proposition 6.8 (that stronger interdependencies can be good), which is not true if investments are very elastic (with respect to the investment specificity parameters).

where $e_1(\varphi_k)$ and $e_2(\psi_k)$ denote the optimal investments of the two managers, for a given investment specificity.

Although not necessary to generate the main results of the paper, it can be helpful to assume a ranking of the ownership structures that I discussed in section 2, in the sense that

$$1 > \gamma_{T1} \geq \gamma_{NI} \geq \gamma_{CO} \geq \gamma_{T2} = \gamma_{JO} \geq 0$$

$$1 > \lambda_{T2} \geq \lambda_{NI} \geq \lambda_{CO} \geq \lambda_{T1} = \lambda_{JO} \geq 0$$

Then, it follows directly from the definitions of φ and ψ that

$$1 > \varphi_{T1} \geq \varphi_{NI} \geq \varphi_{CO} \geq \varphi_{T2} = \varphi_{JO} \geq \tfrac{1}{2}$$

$$1 > \psi_{T2} \geq \psi_{NI} \geq \psi_{CO} \geq \psi_{T1} = \psi_{JO} \geq \tfrac{1}{2}$$

With these assumptions, the value of the outside option increases (weakly) with the number of assets the manager controls. Consider the set of inequalities for manager 1. By definition, there is a special link between manager 1 and asset 1, and the outside value is therefore assumed higher for the manager if she owns *her* asset instead of the other one (i.e. $\gamma_{NI} \geq \gamma_{CO}$). Type 2 integration and joint ownership are equivalent with respect to the outside option for manager 1, since manager 2 has the right to exclude her from both assets under both ownership structures.

The expected joint surplus increases in φ and ψ for the relevant range of these parameters. Joint ownership and cross ownership are therefore (weakly) dominated by non-integration in the spot governance mode (since $\varphi_{NI} \geq \varphi_{CO} \geq \varphi_{JO}$ and $\psi_{NI} \geq \psi_{CO} \geq \psi_{JO}$).

4. A linear implicit contract

An implicit contract is based on the realisations of the observable, but non-verifiable benefits of the two parties (θ_1^C and θ_2^C). Assume that the implicit contract is restricted to be linear, in the form of a vector (a, b, t), where a is 1's share of θ_1^C, b is 2's share of θ_2^C and t is a fixed transfer, which is positive when manager 1 is on the receiving end. Linear contracts are attractive from a bounded rationality perspective and to avoid strategic behaviour over time (during a period).[7]

After the uncertainty is resolved in a period, the two parties can write a verifiable contract on specific amounts, so there is no risk of one of the parties honouring the implicit contract ex-post while the other does not. Either the implicit contract is fulfilled in its entirety, or, if a party chooses to renege, the parties' bargaining positions decide the distribution of the surplus for that period (as in the spot governance mode).

[7] Holmstrom and Milgrom (1987) argue convincingly for linear explicit incentive contracts.

Further assume that both parties and the assets live forever (or die together at a random date). There is a common positive discount rate, r, which is constant over all periods. In other words, the parties are equally patient with respect to when they would like their benefits. The implicit contract is continued as long as both parties respect it. But if one party chooses to renege on the contract, all *trust* is destroyed, and the parties will be unable to agree upon any new implicit contract afterwards.[8]

There are three major scenarios with respect to the future relations of the two parties when an implicit contract is broken. The most extreme would be that they become so angry with each other that no transaction is possible whatsoever. Or, they could agree to deal with each other in a spot governance mode without being allowed to change the ownership structure, even if another structure would yield a higher expected joint surplus (as in Halonen 1994). Finally, they could transfer the ownership rights (if that is desirable), and then settle in a spot governance mode under the best possible ownership structure for that mode (as in Baker, Gibbons and Murphy 1996).

Theoretically, the second scenario is odd, because the ownership structure under the implicit contract also decides the joint surplus after the implicit contract is broken. In other words, the parties could agree upon a very disadvantageous ownership structure to increase the expected *punishment* associated with reneging on the contract.

In my opinion, the third scenario is more consistent with the basic assumptions. If the parties could have agreed upon a renegotiation solution under spot governance in the first place, then it is difficult to understand why they cannot agree upon an ownership transfer and a future spot relationship after an implicit contract is broken. The ownership transfer does only require that they agree upon a fixed payment, which is verifiable and can be enforced by a court. And the spot governance mode as such does not require any trust at all, so the fact that there has been an implicit contract in place should not stop the parties from entering a spot relationship afterwards (at least in a world without heated emotions).[9]

Assume therefore that an ownership transfer is possible after one of the parties reneges on the implicit contract. Index the best ownership structure under an implicit contract $i \in K$, and the best ownership structure under spot governance $s \in K$. Using the expression for the expected joint surplus from section 3, the discounted value added (Δ) from the transfer of ownership rights is given by

$$\Delta = {}^1/_r \left[\{ \varphi_s - ½ \varphi_s^2 + \psi_s - ½ \psi_s^2 \} - \{ \varphi_i - ½ \varphi_i^2 + \psi_i - ½ \psi_i^2 \} \right]$$

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[8] Later I will focus on self-enforcing implicit contracts, where the probability of an implicit contract violation actually occurring is zero.

[9] Note that under spot governance, if the transaction involves a transfer of a good ex-post, the parties must be able to write a verifiable contract *at this point of time* on the transfer of the good. Then the uncertainty is already resolved (for that period) and the parties can describe in detail the characteristics of the good and the fixed payment for the transfer. (While the uncertainty ex-ante makes contingent contracts too costly to write.)

By definition $\Delta \geq 0$. Assume a 50:50 split of the value added from such a transfer.

Note that although we allow a transfer of ownership rights after an implicit contract violation, it turns out that it usually will be optimal to base the implicit contract on the same ownership structure as under spot governance anyway (so that $\Delta = 0$). The case where the parties indeed do expect a transfer of ownership rights is important for the choice of ownership structure, while the case where they do not expect such a transfer is relevant for the initial choice of technology

For an implicit contract to hold, it must be incentive compatible for the two managers both ex-ante and ex-post in every period. *Ex-ante*, a manager can follow three strategies.

First, she can plan to keep the implicit contract forever. Given that the other manager follows the same strategy, the managers' effort levels are then

$$e_1 = \underset{e_1}{\text{Argmax}} \{ a\, e_1 + (1-b)\, e_2 + t - \tfrac{1}{2} e_1^2 \} = a$$

$$e_2 = \underset{e_2}{\text{Argmax}} \{ (1-a)\, e_1 + b\, e_2 - t - \tfrac{1}{2} e_2^2 \} = b$$

Second, she can ex-ante choose to not accept the implicit contract and communicate this to the other manager. Then a transfer of assets will occur immediately (if that is optimal), and there will be a spot relationship from period one. For the two managers to instead prefer the implicit contract (and follow the first strategy), the following inequalities must be satisfied

(1a) $\quad {}^1/_r \{ \tfrac{1}{2} a^2 + b(1-b) + t \} \geq {}^1/_r \{ \tfrac{1}{2} \varphi_i^{\,2} + \psi_i (1-\psi_i) \} + \tfrac{1}{2} \Delta$

(1b) $\quad {}^1/_r \{ \tfrac{1}{2} b^2 + a(1-a) - t \} \geq {}^1/_r \{ \tfrac{1}{2} \psi_i^{\,2} + \varphi_i (1-\varphi_i) \} + \tfrac{1}{2} \Delta$

Third, the manager can pretend that she accepts the implicit contract but *plan* to renege on it. Say that manager 1 follows this strategy while manager 2 invests according to the implicit contract. Manager 1 then invests φ, which will also be her share of her own (reduced) value added. On the other hand, she expects to end up with a higher share of manager 2's value added. In future periods the spot governance mode prevails. The following inequalities must thus hold for the two managers to prefer to be honest (and follow the first strategy)

(2a) $\quad (1 + {}^1/_r)\{ \tfrac{1}{2} a^2 + b(1-b) + t \} \geq \tfrac{1}{2} \varphi_i^2 + b(1-\psi_i) + {}^1/_r \{ \tfrac{1}{2} \varphi_i^{\,2} + \psi_i (1-\psi_i) \} + \tfrac{1}{2} \Delta$

(2b) $\quad (1 + {}^1/_r)\{ \tfrac{1}{2} b^2 + a(1-a) - t \} \geq \tfrac{1}{2} \psi_i^2 + a(1-\varphi_i) + {}^1/_r \{ \tfrac{1}{2} \psi_i^{\,2} + \varphi_i (1-\varphi_i) \} + \tfrac{1}{2} \Delta$

Ex-post, after the uncertainty for that period is resolved, a manager may be tempted to renege on the implicit contract, if the value added of the other manager is unexpectedly high while her own value added is low. Then the spot bargaining solution (φ, ψ) can be better for her in that particular period than the implicit contract (a, b). On the other hand, if she reneges, a spot relationship prevails forever after which (in expectancy) implies lower future benefits, as given by (1a) and (1b). So for both managers to honour the contract ex-post, the following two inequalities must hold in any given period

$$\text{(3a)}\quad a(e_1(a) + \varepsilon_1) + (1-b)(e_2(b) + \varepsilon_2) + t + 1/r\,[\,ae_1(a) + (1-b)e_2(b) + t - c_1(e_1(a))\,]$$
$$\geq\; \varphi_i(e_1(a) + \varepsilon_1) + (1-\psi_i)(e_2(b) + \varepsilon_2) + 1/r\,[\,\varphi_i e_1(\varphi_i) + (1-\psi_i)e_2(\psi_i) - c_1(e_1(\varphi_i))\,] + ½\,\Delta$$

$$\text{(3b)}\quad (1-a)(e_1(a) + \varepsilon_1) + b(e_2(b) + \varepsilon_2) - t + 1/r\,[\,(1-a)e_1(a) + be_2(b) - t - c_2(e_2(b))\,]$$
$$\geq\; (1-\varphi_i)(e_1(a) + \varepsilon_1) + \psi_i(e_2(b) + \varepsilon_2) + 1/r\,[\,(1-\varphi_i)e_1(\varphi_i) + \psi_i e_2(\psi_i) - c_2(e_2(\psi_i))\,] + ½\,\Delta$$

DEFINITION 4.1: An implicit contract is *self-enforcing* if (3a) and (3b) hold for all possible realisations of the uncertain variables ε_1 and ε_2.[10]

Later I will show that $a \geq \varphi_i$ and $b \geq \psi_i$ in all optimal implicit contracts. For now, just assume that this is true. Remember that $\varepsilon_j \in [-\varepsilon, \varepsilon]$. For an implicit contract to be self-enforcing, (3a) must hold for $(\varepsilon_1, \varepsilon_2) = (-\varepsilon, \varepsilon)$ and (3b) must hold for $(\varepsilon_1, \varepsilon_2) = (\varepsilon, -\varepsilon)$. (3a) and (3b) are then satisfied for all possible combinations of ε_1 and ε_2. Note that we do not have to decide the particular probability distributions of ε_1 and ε_2.

We know that $(e_1, e_2) = (\varphi_i, \psi_i)$ under spot governance and $(e_1, e_2) = (a, b)$ if the implicit contract is expected to hold. When $a \geq \varphi_i$ and $b \geq \psi_i$, the self-enforcing constraints can thus be written as

$$\text{(4a)}\quad (b-\psi_i)(b+\varepsilon) - (a-\varphi_i)(a-\varepsilon) - t \;\leq\; 1/r\,[\,½\,a^2 + b(1-b) + t - ½\,\varphi_i^2 - \psi_i(1-\psi_i)\,] - ½\,\Delta$$

$$\text{(4b)}\quad (a-\varphi_i)(a+\varepsilon) - (b-\psi_i)(b-\varepsilon) + t \;\leq\; 1/r\,[½\,b^2 + a(1-a) - t - ½\,\psi_i^2 - \varphi_i(1-\varphi_i)\,] - ½\,\Delta$$

In other words, the gains from reneging in that particular period (that are given on the left-hand sides of the inequalities) must be offset by the expected future losses (that are given on the right hand sides). Observe that the constraints are strengthened (for the same values of φ_i and ψ_i) if a transfer of ownership rights is expected after an implicit contract is broken (i.e. $\Delta > 0$), compared to the case where no such transfer is expected (i.e. $\Delta = 0$), since the *punishment* is reduced.

It is straightforward to show that (4a) and (4b) are stronger than the ex-ante constraints (1a), (1b), (2a) and (2b) if

$$\text{(5)}\quad \varepsilon \;\geq\; \mathrm{Max}\left(\frac{(a-\varphi_i)^2}{2(a-\varphi_i+b-\psi_i)},\; \frac{(b-\psi_i)^2}{2(a-\varphi_i+b-\psi_i)},\; \frac{\left|a(a-\varphi_i)-b(b-\psi_i)-t\right|}{a-\varphi_i+b-\psi_i} \right)$$

All the major results of this paper are valid, irrespective of whether it is the ex-ante or the ex-post constraints that are binding (although a couple of the propositions must be slightly

[10] Self-enforcement is a strong condition (which is also used by Baker, Gibbons and Murphy 1996). In a more realistic version of the model, the parties could be willing to engage in an implicit contract that is broken in a given period with some positive probability. However, this extension does not seem to add significant insights.

rephrased). It turns out to be more convenient to work with the ex-post constraints. Therefore assume that ε is large enough so that (5) is satisfied. Then the ex-ante constraints can be ignored. Note that the right hand side of (5) typically is quite small compared to investment levels, so there is not much uncertainty that is needed for it to hold.

An optimal self-enforcing implicit contract then solves

$$\max_{(a,b,t)} \{ a - ½ a^2 + b - ½ b^2 \}, \text{ subject to (4a) and (4b).}$$

Define $I \equiv {}^3/_2(\varphi_i^2 - \psi_i^2) - (\varphi_i - \psi_i)$. Note that $\varphi_i < \psi_i \Leftrightarrow I < 0$ for $\varphi_i, \psi_i \in [½, 1)$. I can be interpreted as a measure of manager 1's bargaining position relative to manager 2, given the ownership structure under the implicit contract. Remember from section 3 that the expected joint surplus in the spot governance mode is given by $\Omega_s \equiv \varphi_s + \psi_s - ½ (\varphi_s^2 + \psi_s^2)$. Setting in for Δ, (4a) and (4b) can then be reformulated as

$$\text{(6a)} \qquad (b-\psi_i)(b+\varepsilon) - (a-\varphi_i)(a-\varepsilon) - t \leq 1/r\,[½ a^2 + b(1-b) + t - ½ I - ½ \Omega_s]$$

$$\text{(6b)} \qquad (a-\varphi_i)(a+\varepsilon) - (b-\psi_i)(b-\varepsilon) + t \leq 1/r\,[½ b^2 + a(1-a) - t + ½ I - ½ \Omega_s]$$

where $\Omega_s = \Omega_i$ if no transfer of ownership rights is expected after an implicit contract violation.

The Lagrangian for the optimal self-enforcing implicit contract is given by

$$\text{(7)} \qquad L(a, b, t, \lambda_1, \lambda_2) = a - ½ a^2 + b - ½ b^2$$
$$- \lambda_1 \{ (b-\psi_i)(b+\varepsilon) - (a-\varphi_i)(a-\varepsilon) - t - 1/r\,[½ a^2 + b(1-b) + t - ½ I - ½ \Omega_s] \}$$
$$- \lambda_2 \{ (a-\varphi_i)(a+\varepsilon) - (b-\psi_i)(b-\varepsilon) + t - 1/r\,[½ b^2 + a(1-a) - t + ½ I - ½ \Omega_s] \}$$

where λ_1 and λ_2 denote the Lagrange multipliers for (6a) and (6b) respectively. Remember that this expression is valid only when $a \geq \varphi_i$ and $b \geq \psi_i$.

5. The optimal implicit contract with a fixed transfer

The implicit contract defined in the previous section could include a fixed transfer (as in Baker, Gibbons and Murphy 1996). I will later argue that such transfers are not observed in business relations due to risk aversion, bounded rationality and social norms. However, from a theoretical point of view, it is interesting to study how such implicit contracts would have performed.

In section 4 I assumed that incentives are stronger under the implicit contract for both managers. Now I need to show that this result in fact does hold.

PROPOSITION 5.1: An optimal implicit contract (with a fixed transfer) provides (weakly) stronger incentives for both the two managers compared to the spot governance mode under the same ownership structure (i.e. $a \geq \varphi_i$ and $b \geq \psi_i$).

PROOF: Proof by contradiction. Say that $a < \varphi_i$. Then $b > \psi_i$, since the implicit contract otherwise is worse than the spot governance mode. For the implicit contract to be self-enforcing, (3a) must hold for $(\varepsilon_1, \varepsilon_2) = (\varepsilon, \varepsilon)$ and (3b) must hold for $(\varepsilon_1, \varepsilon_2) = (-\varepsilon, -\varepsilon)$. The Lagrangian for the optimal implicit contract is then given by

$$L(a, b, t, \lambda_1, \lambda_2) = a - ½\, a^2 + b - ½\, b^2$$
$$- \lambda_1 \{ (b-\psi_i)(b+\varepsilon) + (\varphi_i-a)(a+\varepsilon) - t - 1/r\, [\, ½\, a^2 + b(1-b) + t - ½\, I - ½\, \Omega_s\,] \}$$
$$- \lambda_2 \{ -(\varphi_i-a)(a-\varepsilon) - (b-\psi_i)(b-\varepsilon) + t - 1/r\, [\, ½\, b^2 + a(1-a) - t + ½\, I - ½\, \Omega_s\,] \}$$

where λ_1 and λ_2 denote the Lagrange multipliers for the two self-enforcement constraints. The first-order condition with respect to t implies that $\lambda_1 = \lambda_2 \equiv \lambda$ for the optimal contract. Then $\partial L / \partial a = 1-a + \lambda\{2\varepsilon + 1/r(1-a)\}$, which is positive for $a < \varphi_i$ (< 1). In other words, in the optimal contract a should be set at least equal to φ_i. But this result contradicts the assumption that $a < \varphi_i$, which thus cannot hold. Similar for $b < \psi_i$. QED.

We can therefore use (7) from the previous section to find the optimal implicit contract. But we must check that the solution does satisfy the requirement that $a \geq \varphi_i$ and $b \geq \psi_i$. As in the proof of proposition 5.1, the first-order condition with respect to t implies that $\lambda_1 = \lambda_2 \equiv \lambda$. The fixed transfer t is used to make the 'marginal costs' of each constraint the same. (6a) and (6b) can therefore be combined to one constraint

$$(8) \qquad 2\varepsilon\, (a + b - \varphi_i - \psi_i) \leq 1/r\, (a - ½a^2 + b - ½b^2 - \Omega_s)$$

If this constraint is satisfied, some t always exists, so that both (6a) and (6b) hold.

First, consider the situation where $a > \varphi_i$ and $b > \psi_i$. The first-order conditions with respect to a and b then imply that the managers will enjoy equal incentives, even if they have very different bargaining positions (i.e. $a = b \equiv \alpha$). Equal incentives are good, since the managers have identical convex cost functions. The solution to the optimisation problem is given by

$$(9) \qquad \overline{\alpha} = \mathrm{Min}\left(1, 1 - 2\varepsilon r + \sqrt{(1-2\varepsilon r)^2 + 2\varepsilon r(\varphi_i + \psi_i) - \Omega_s}\right)$$

Before we go on, consider under what circumstances first-best is sustainable.

PROPOSITION 5.2: A first-best implicit contract is *always* sustainable if the two parties are sufficiently patient (i.e. the discount rate is sufficiently low), when the implicit contract can include a fixed transfer.

PROOF: From (8) we see that first-best can be sustained when $2\varepsilon(2 - \varphi_i - \psi_i) \leq 1/r(1 - \Omega_s)$, which is always satisfied for $r \to 0$, since $\Omega_s < 1$ for all $\varphi_s, \psi_s \in [½, 1)$. QED.

Second, assume that $\overline{\alpha} < \text{Max}(\varphi_i, \psi_i)$. Say for instance that $\psi_i < \varphi_i$, so that $\psi_i < \overline{\alpha} < \varphi_i$. From the proof of proposition 5.1 we then know that $a^* = \varphi_i$. Set this value of a into the constraint (8), and solve for the optimal value of b

$$(10) \qquad \overline{b} = 1 - 2\varepsilon r + \sqrt{(1-2\varepsilon r)^2 + 2\varphi_i - \varphi_i^2 + 4\varepsilon r \psi_i - 2\Omega_s}$$

Similarly, consider the case where $\varphi_i < \psi_i$, so that $b = \psi_i$. Then the optimal a is given by

$$(11) \qquad \overline{a} = 1 - 2\varepsilon r + \sqrt{(1-2\varepsilon r)^2 + 2\psi_i - \psi_i^2 + 4\varepsilon r \varphi_i - 2\Omega_s}$$

The incentives under the optimal implicit contract are thus given by

$$(a^*, b^*) = \begin{cases} (\overline{\alpha}, \overline{\alpha}) & \text{if} \quad \text{Max}(\varphi_i, \psi_i) \leq \overline{\alpha} \\ (\varphi_i, \overline{b}) & \text{if} \quad \psi_i < \overline{\alpha} < \varphi_i \\ (\overline{a}, \psi_i) & \text{if} \quad \varphi_i < \overline{\alpha} < \psi_i \end{cases}$$

where $\overline{\alpha}, \overline{a}$ and $\overline{b}$ are defined in (9), (10) and (11). Now consider the fixed transfer of the contract.

PROPOSITION 5.3: The manager with the best bargaining position will receive the fixed transfer, if such a transfer is part of the optimal implicit contract (i.e. $\varphi_i > \psi_i \Rightarrow t \geq 0$ and $\varphi_i < \psi_i \Rightarrow t \leq 0$).

PROOF: First, assume that $(a^*, b^*) = (\overline{\alpha}, \overline{\alpha})$, and that (6a) and (6b) bind. Subtract each side of (6b) from the respective side of (6a) to find t

$$t = \frac{\tfrac{1}{2}I + (\varphi_i - \psi_i)\overline{\alpha} r}{1 + r}$$

Since $\varphi_i > \psi_i \Leftrightarrow I > 0$, it follows directly that t must be positive if $\varphi_i > \psi_i$, and vice versa. If the constraints are not binding, then a non-zero t is not needed in the implicit contract.

Second, consider the situation where $\psi_i < \overline{\alpha} < \varphi_i$. Then (6a) and (6b) with $(a^*,b^*) = (\varphi_i, \overline{b})$ imply that

$$t = \frac{(\overline{b} - \psi_i)(r\overline{b} + \tfrac{3}{4}(\overline{b} + \psi_i) - \tfrac{1}{2})}{1 + r}$$

which also must be positive, since $\overline{b} > \psi_i \geq ½$. Similarly, $\varphi_i < \overline{\alpha} < \psi_i$ implies that $t < 0$. QED.

An implicit contract with fixed transfers does not seem very realistic, since it is always the party with the worst bargaining position that must commit to a recurring fixed payment. Such transfers are usually not observed in business transactions. Risk considerations and wealth constraints are probably important reasons, since the weakest party can have difficulties paying in periods where profits are low due to uncertain (external) factors. It can also conflict with the parties' social norms (with respect to equity), if it is not considered fair to take advantage of another party's high investment specificity to secure a fixed payment in addition to a large share (up to 100 percent) of own value added. Finally, the managers may have difficulties understanding the role fixed payments could play in implicit contracts, while it is straightforward that a higher share of own value added strengthens the incentives to invest.

Instead managers and owners tend to focus on the respective *shares* of the value added that the different units are entitled to. In the next section I will therefore study a version of the model where a fixed transfers is not allowed as part of the implicit contract. Note that I do not claim that fixed transfers are not important in business relations. But, I would argue that when there is such a recurring payment, it is usually part of a verifiable contract, and it is paid *to* the weaker party as part of a risk sharing arrangement.

6. The optimal implicit contract without a fixed transfer

As I discussed above, a model where the implicit contract does not include a fixed transfer does seem to better conform to actual business practice. Assume, therefore, that t must be set equal to zero. It is then not possible to derive a simple closed-form solution to the optimisation problem that was given by the Lagrangian (7) in section 4. We must instead show the results in a somewhat more indirect way.

It turns out that the ex-ante constraints (1a) and (1b), where $t = 0$, now are useful to prove that incentives are stronger for both the managers under the implicit contract.

PROPOSITION 6.1: A viable implicit contract (without a fixed transfer) provides stronger incentives for *both* the two managers compared to the spot governance mode under the same asset ownership structure (i.e. $a > \varphi_i$ and $b > \psi_i$).

PROOF: (1a) and (1b) must also hold for $\Delta = 0$ (since $\Delta \geq 0$). Set $\Delta = 0$, multiply each inequality with r (which is positive) and reformulate to get

(12a) $\frac{1}{2}(a - \varphi_i)(a + \varphi_i) - (b - \psi_i)(b + \psi_i - 1) \geq 0$

(12b) $\frac{1}{2}(b - \psi_i)(b + \psi_i) - (a - \varphi_i)(a + \varphi_i - 1) \geq 0$

First, note that at least one of the inequalities $a > \varphi_i$ and $b > \psi_i$ must hold for an implicit contract to yield a higher joint surplus than the spot governance mode. Suppose $a > \varphi_i$. The second term of (12b) is then negative (since $\varphi_i \geq ½$). For the inequality to hold, the first term must therefore be positive. That is, $a > \varphi_i \Rightarrow b > \psi_i$. Similarly, $a > \varphi_i$ must hold for (12a) to be satisfied if $b > \psi_i$. QED.

In other words, we can again use the optimisation problem as it is stated in (7), but we do not need to check for $a \geq \varphi_i$ and $b \geq \psi_i$ anymore, since the optimal contract always will satisfy those conditions. From constraints (6a) and (6b) we can calculate the maximum discount rate for a given implicit contract to be feasible (when t = 0).

$$r \leq [\, ½\, a^2 + b(1-b) - ½\, I - ½\, \Omega_s \,] \,/\, [\, (b-\psi_i)(b+\varepsilon) - (a-\varphi_i)(a-\varepsilon) \,] \equiv f(a, b, \varphi_i, \psi_i, \Omega_s)$$

$$r \leq [\, ½\, b^2 + a(1-a) + ½\, I - ½\, \Omega_s \,] \,/\, [\, (a-\varphi_i)(a+\varepsilon) - (b-\psi_i)(b-\varepsilon) \,] \equiv g(a, b, \varphi_i, \psi_i, \Omega_s)$$

That is, $r \leq \text{Min}\{f(\cdot), g(\cdot)\}$. It can be shown that for a viable implicit contract, f_a, $g_b > 0$ and f_b, $g_a < 0$.[11]

PROPOSITION 6.2: The manager with the strongest bargaining position will also (weakly) have the strongest incentives to invest under the optimal implicit contract (i.e. $\varphi_i > \psi_i \Rightarrow a \geq b$ and $\varphi_i < \psi_i \Rightarrow a \leq b$).

PROOF: Suppose $\varphi_i > \psi_i$. If a = b, then $g(\cdot) > f(\cdot) \geq r$ for a viable implicit contract. Since $f_a > 0$ and $g_a < 0$, the coefficient a can be increased until $g(\cdot) = f(\cdot)$. That will be a better implicit contract, since manager 1's incentives are strengthened, unless a and b already take the first-best values. a < b will never be optimal, since $g(\cdot) > f(\cdot)$ then too. (To reach an optimal implicit contract, both a and b should be increased, but a must be increased more than b.) Similar for $\varphi_i < \psi_i$. QED.

COROLLARY: Managers with equal bargaining positions will enjoy the same incentive strength under an implicit contract (i.e. $\varphi_i = \psi_i \Rightarrow a = b$).

PROOF: From the proof of proposition 6.2 it is clear that $\varphi_i \geq \psi_i \Rightarrow a \geq b$ and $\varphi_i \leq \psi_i \Rightarrow a \leq b$. a = b must therefore hold for $\varphi_i = \psi_i$. QED.

Note that proposition 6.2 and its corollary are true only when the production technologies of the two managers are symmetrical in nature. That is, the benefit and cost functions must be identical, and the ranges of the two error terms must be the same.

PROPOSITION 6.3: For sufficiently low discount rate r (i.e. the parties are sufficiently patient), a self-enforcing implicit contract always exists that is better than the optimal spot governance relationship.

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[11] To show the sign of these derivatives, remember that $a > \varphi_i \geq ½$, $b > \psi_i \geq ½$ and $f(\cdot), g(\cdot) > 0$.

PROOF: Suppose that the parties choose the best ownership structure for the spot governance mode as a basis for the implicit contract, so that $\Delta = 0$. In this setting, we must show that for any combination (φ_i, ψ_i), where $\varphi_i, \psi_i \in [½, 1)$, there always exists a pair (a, b), where $a \in (\varphi_i, 1]$ and $b \in (\psi_i, 1]$, so that the right hand sides of (4a) and (4b) both are positive, when $t = 0$. Then the inequalities will hold if r is sufficiently low.

The following two inequalities are sufficient conditions for the right hand sides of (4a) and (4b) to be positive when $\Delta = 0$

$$a > \sqrt{\varphi_i^2 + 2\psi_i(1-\psi_i) - 2b(1-b)} \equiv h(b)$$

$$a < ½ + ½\sqrt{1 + 2b^2 - 2\psi_i^2 - 4\varphi_i(1-\varphi_i)} \equiv k(b)$$

$b \to \psi_i \Rightarrow h(b), k(b) \to \varphi_i$ and $k'(b) > h'(b) > 0$. Then some $b > \psi_i$ must exist, so that there is a non-empty range (h(b), k(b)) from which $a > \varphi_i$ can be chosen to satisfy both these conditions. QED.

In a first-best implicit contract (a, b) = (1, 1). The self-enforcing constraints can then be written as

$$r \le ½ \frac{1 - I - \Omega_s}{(1-\psi_i)(1+\varepsilon) - (1-\varphi_i)(1-\varepsilon)} \equiv f^{FB}(\varphi_i, \psi_i, \Omega_s)$$

$$r \le ½ \frac{1 + I - \Omega_s}{(1-\varphi_i)(1+\varepsilon) - (1-\psi_i)(1-\varepsilon)} \equiv g^{FB}(\varphi_i, \psi_i, \Omega_s)$$

Since $\varphi_i < \psi_i \Leftrightarrow f^{FB}(\cdot) > g^{FB}(\cdot)$ for $\varphi_i, \psi_i \in [½, 1)$, it is only the self-enforcing constraint for the manager with the strongest bargaining position that is relevant for a first-best implicit contract.

PROPOSITION 6.4: First-best is not always sustainable, even if the discount rate goes to zero, when the implicit contract cannot include a fixed transfer.

PROOF: Let $r \to 0$. (4a) and (4b) are then reduced to the ex-ante constraints (1a) and (1b). With $t = 0$, $\Delta = 0$ and $a = b = 1$, these constraints imply that

$$½ + ½\sqrt{2\psi_i^2 - 1} \le \varphi_i \le \sqrt{1 - 2\psi_i(1-\psi_i)} \quad \text{for} \quad \psi_i > \sqrt{½}.$$

For $\psi_i \le \sqrt{½}$, only the second inequality is relevant. Note that the values φ_i can take always include ψ_i. Say that $\psi_i = 0.75$. Then $0.677 \le \varphi_i \le 0.791$ must hold for a first-best implicit contract to be sustainable. The constraints will be even stricter for $\Delta > 0$. If φ_i has a value outside the critical range, first-best is not sustainable. QED.

The proof of proposition 6.4 indicates that for a first-best implicit contract to be self-enforcing, the two managers must enjoy relatively similar bargaining positions. The next proposition shows that equal bargaining positions are good to sustain first-best, since deviations from such symmetry always will increase one of the parties' temptation to renege on the implicit contract.

PROPOSITION 6.5: Suppose that an ownership structure can be chosen where the managers have equal bargaining positions ($\varphi = \psi$), and that the managers are just sufficiently patient for first-best to be sustained with an implicit contract (without fixed transfer) for that ownership structure. That is, $r = f^{FB}(\cdot) = g^{FB}(\cdot)$. A one-sided change in bargaining positions would then require the parties to be more patient for the first-best implicit contract to still be self-enforcing (since $f^{FB}(\cdot)$ or $g^{FB}(\cdot)$ must decrease).

PROOF: Say that $\varphi_i = \psi_i$. Then $f^{FB}(\cdot) = g^{FB}(\cdot)$. It is straightforward to verify that f_φ^{FB}, $g_\psi^{FB} < 0$ and f_ψ^{FB}, $g_\varphi^{FB} > 0$, both when a transfer of ownership rights is expected after an implicit contract is broken and when it is not expected (as long as $f^{FB}(\cdot), g^{FB}(\cdot) > 0$). A one-sided increase or decrease in φ_i or ψ_i must therefore reduce either $f^{FB}(\cdot)$ or $g^{FB}(\cdot)$. QED.

The basic results that were stated in propositions 6.1, 6.2 and 6.3 are valid regardless of whether the implicit contract can include a fixed transfer or not. That is not true for propositions 6.4 and 6.5. As proposition 5.2 indicated, symmetry is not important for first-best implicit contracts with a fixed transfer. But, without such a transfer, the implicit contract is no longer as effective. It is then more difficult to provide the managers with equal incentives (which is good because the managers have equal convex cost functions). That means that the choice of ownership structure becomes more important. Ownership structures with symmetrical bargaining positions are good, because it is then easier to achieve similar incentive strengths for the two managers.

a) The choice of ownership structure

Now consider the choice of ownership structure in some more detail. Assume that technology is given, so that the only way the managers can influence their respective bargaining positions is through their common choice of ownership structure.

To investigate whether it in general is optimal to choose an ownership structure different from the one that is optimal under spot governance, consider the optimisation problem given in (7) when a transfer of ownership rights is expected to take place after an implicit contract violation ($\Delta > 0$). Due to the envelope theorem, $\partial L/\partial\varphi_i$ and $\partial L/\partial\psi_i$ express the change in the maximum joint surplus for a one-sided strengthening of manager 1's and manager 2's bargaining positions respectively.

(13a) $$\partial L / \partial\varphi_i = - \lambda_1 \{ a - \varepsilon + ½ (3\varphi_i-1) / r \} + \lambda_2 \{ a + \varepsilon + ½ (3\varphi_i-1) / r \}$$

(13b) $\partial L / \partial \psi_i = \lambda_1 \{ b + \varepsilon + ½ (3\psi_i - 1) / r \} - \lambda_2 \{ b - \varepsilon + ½ (3\psi_i - 1) / r \}$

PROPOSITION 6.6: Say that r is sufficiently low so that a self-enforcing implicit contract exists that is better than the best spot governance relationship. Then it is always optimal to marginally *strengthen* one of the parties' bargaining positions (while the other is held constant), as long as both coefficients of the optimal implicit contract are below the first-best level (a, b < 1), a transfer of ownership rights is expected to take place after an implicit contract is broken and the bargaining positions under the spot governance mode are not affected.

PROOF: $\lambda_1, \lambda_2 > 0$ if both constraints are binding. In (13a) use the expressions for λ_1 and λ_2, that are found from $\partial L / \partial a = 0$ and $\partial L / \partial b = 0$, to find

$$\partial L / \partial \varphi_i > 0 \quad \Leftrightarrow \quad (1-a)\,(a + 2b - \psi_i + \frac{3(b+\varphi_i)-2}{2r}) + (1-b)\,(a - \varphi_i + \frac{3(a-\varphi_i)}{2r}) > 0$$

The latter inequality is always satisfied when a, b < 1, since $a > \varphi_i \geq ½$ and $b > \psi_i \geq ½$. Similar for $\partial L / \partial \psi_i$. QED.

Strong bargaining positions are in general good for the implicit contract, since the temptation to renege then is weak for a given implicit contract (as φ_i is close to a and ψ_i is close to b). That means that there will be a tendency to choose the ownership structure under an implicit contract with as strong bargaining positions as possible. This tendency is also present under spot governance, since the expected joint surplus, $\Omega_s = \varphi_s + \psi_s - ½ (\varphi_s^2 + \psi_s^2)$, increases in φ_s and ψ_s for the relevant range of these parameters. These two results held together show that the same ownership structure tends to maximise the expected joint surplus both under spot governance and implicit contracting. However, as propositions 6.4 and 6.5 indicate, an implicit contract can also benefit from symmetry in the bargaining positions. Hence, if another ownership structure implies more symmetrical bargaining positions, it can be optimal to choose that structure instead of the one that is optimal under spot governance.[12]

To illustrate how an implicit contract can benefit from symmetry, assume that the best ownership structure in a spot governance mode is $(\varphi_s, \psi_s) = (0.9, 0.6)$, so that $\Omega_s = 0.915$, and set $\varepsilon = ½$. A first-best implicit contract is then self-enforcing for a given set of (φ_i, ψ_i), if the discount rate (r) is not higher than the values given in table 1. Some boxes are left blank. These combinations of φ_i and ψ_i are not relevant for the given value of Ω_s, since if they were available in the implicit contract mode, they would also be available as spot governance structures yielding a higher Ω_s. Negative values indicate that the first-best implicit contract is not self-enforcing even if the discount rate is zero.

[12] There is also a tendency to choose the same ownership structures for both governance modes if the implicit contract can include a fixed transfer, but then more *asymmetrical* bargaining positions can support a better implicit contract under some settings.

φ_i \ ψ_i	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	0.99
0.50	0.09	0.05	0.02	-0.02	-0.06	-0.11	-0.15	-0.20	-0.25	-0.31	-0.35
0.55	0.05	0.09	0.05	0.00	-0.04	-0.10	-0.15	-0.20	-0.26	-0.32	-0.37
0.60	0.02	0.05	0.11 ^{JO}	0.05 ^{CO}	-0.01	-0.07	-0.14	-0.20	-0.26 ^{T1}		
0.65	-0.02	0.00	0.05	0.12	0.04	-0.03 ^{NI}					
0.70	-0.06	-0.04	-0.01 ^{T2}	0.05	0.14						
0.75	-0.11	-0.10	-0.07	-0.03							
0.80	-0.15	-0.15	-0.14								
0.85	-0.20	-0.20	-0.20								
0.90	-0.25	-0.26	-0.26								
0.95	-0.31	-0.32									
0.99	-0.35	-0.37									

Table 1.

Observe that a one-sided weakening of a party's bargaining position now can be good to sustain a first-best contract, since it leads to more symmetrical bargaining positions. This may seem counter to proposition 6.6, but the reader should remember that the proposition was valid only for a, b < 1. It can be optimal to set one of the coefficients higher than one, if the bargaining positions are very different (and the implicit contract is relatively close to achieve first-best). Then the inefficiencies due to over-investment are outweighed by the strengthened incentives to invest for the manager with the weakest bargaining positions. Over-investment is necessary to keep the implicit contract self-enforcing. Weakening the strongest bargaining position can then be good, since over-investment is reduced and at the same time the other (under-investing) manager's incentives can be strengthened.

Since technology is fixed, the two managers can only choose between five sets of (φ_i, ψ_i), that correspond to the five ownership structures defined in section 2. In the table I have indicated five boxes with grey shading, so that the basic assumptions of section 3 with respect to bargaining positions for the different ownership structures are satisfied ($\varphi_{T1} \geq \varphi_{NI} \geq \varphi_{CO} \geq \varphi_{T2} = \varphi_{JO}$ and $\psi_{T2} \geq \psi_{NI} \geq \psi_{CO} \geq \psi_{T1} = \psi_{JO}$). This example is summarised in table 2.

Ownership structure	φ_i	ψ_i	Max r to sustain first-best
T1	0.90	0.60	-0.26
NI	0.75	0.65	-0.03
CO	0.65	0.60	0.05
T2	0.60	0.70	-0.01
JO	0.60	0.60	0.11

Table 2.

Say for instance that the discount rate is 0.08. Then joint ownership (partnership) is optimal, since that is the only structure where first-best can be sustained. But if we change the assumptions with respect to what bargaining positions that each ownership structure implies, the ranking can change. Say that (φ_{CO}, ψ_{CO}) = (0.65, 0.65), while the other assumptions remain the same. Then cross ownership (mutual hostage taking) dominates the other structures to achieve first-best. Similarly, if (φ_{NI}, ψ_{NI}) = (0.70, 0.70), non-integration (a relational contract) would be better. In this way we can also change around the assumptions so that type 1 or type 2 ownership (firm 1 and firm 2) would be optimal.

PROPOSITION 6.7: The optimal ownership structure for the implicit contract mode can be different from the optimal structure under spot governance. No ownership structure can be ruled out before the corresponding bargaining positions are known.

PROOF: One can easily construct examples from table 1 that satisfy the assumptions with respect to the relative bargaining positions of the different ownership structures, so that in each example a different ownership structure is optimal under the implicit contract, while the structure that is optimal under spot governance remains unchanged. QED.

To sum up, the two managers should choose the same ownership structure under the implicit contract as they would have done under spot governance, unless another ownership structure with more symmetrical bargaining positions can support a better implicit contract. The assumptions we have taken so far are in general not enough to rule out any of the ownership structures as the optimal one under implicit contracting (while joint ownership and cross ownership are dominated by non-integration under spot governance).

b) The choice of technology

Above I assumed that technology was given, so that only the choice of ownership structure could influence the bargaining positions. Now consider the situation where the managers can choose between technologies. For simplicity, assume that the managers choose the ownership structure for the implicit contract that yields the highest expected joint surplus also in the spot governance mode. Then no transfer of ownership rights is expected after an implicit contract violation ($\Delta = 0$). Focus on the interesting special case where the two managers have equal bargaining positions in the first place.

PROPOSITION 6.8: Suppose that the two managers have equal bargaining positions $\varphi = \psi \equiv k$. Assume that the discount rate r is sufficiently low, so that a self-enforcing implicit contract exists for that setting, but that first-best is not sustainable. Then the expected joint surplus can be increased through a *weakening* of one of the parties' bargaining positions (while the other is held constant), when a transfer of ownership rights is not expected to take place after an implicit contract is broken.

PROOF: Set $\varphi \equiv \varphi_i = \varphi_s$ and $\psi \equiv \psi_i = \psi_s$. If $\varphi = \psi \equiv k$, then $a = b \equiv \alpha$ (from the corollary to proposition 6.2) and $\lambda_1 = \lambda_2 \equiv \lambda$ in the Lagrangian for the optimisation problem (since everything is symmetrical). If $\alpha < 1$, both constraints must be binding, so that $\lambda > 0$. $\partial L/\partial\varphi$ and $\partial L/\partial\psi$ express the change in the maximum joint surplus for a one-sided strengthening of manager 1's and manager 2's bargaining positions respectively. From (7) it can then be shown that (when $\varphi = \psi \equiv k$)

$$\frac{\partial L}{\partial \varphi}, \frac{\partial L}{\partial \psi} < 0 \quad \Leftrightarrow \quad r < \frac{1-k}{2\varepsilon}$$

From (4a) and (4b), we know that under these circumstances $r \leq (2 - \alpha - k) / 4\varepsilon$ must hold for the implicit contract to be self-enforcing. The inequality on the right hand side is then always satisfied, since $k < \alpha$. In other words, $\partial L/\partial \varphi < 0$ and $\partial L/\partial \psi < 0$ hold if the implicit contract is self-enforcing, $\varphi = \psi \equiv k$ and $a = b < 1$. QED.

Note that the proposition is independent of whether the implicit contract can include a fixed transfer or not. Compare the result with proposition 6.6, when a weakening of bargaining positions was bad, because the temptation to renege in a given period then increases. Now that effect is countered by an increase in the future losses associated with an implicit contract violation, since the incentives under spot governance are weakened as well. That was not the case in proposition 6.6, where the expected joint surplus under spot governance (Ω_s) was held constant.

Proposition 6.8 shows that with the specific cost functions that I have assumed in this paper, the net effect of a weakening of bargaining positions is positive if the parties have similar bargaining positions to start with. That does no longer need to be the case if the managers have very asymmetrical bargaining positions.[13] Also note that the proposition is no longer true if investments are very elastic with respect to the investment specificity parameters.[14]

Since the proposition holds only when no transfer of ownership rights is expected after an implicit contract violation, the result is not relevant for the choice between ownership structures. But, if there are alternative *technologies*, then one with higher investment specificity can generate a higher joint surplus. Hence, I have shown that under some circumstances stronger interdependencies can be good, even if such a technology does not imply higher returns on investments.[15]

The fact that stronger interdependencies sometimes are good can also be illustrated with a diagram that shows the highest value the discount rate can take for a first-best implicit contract (without fixed transfers) to be self-enforcing, see figure 2 (where $\varepsilon = ½$ and $\Delta = 0$). It can clearly be seen that a weakening of φ (ψ) is always good to sustain a first-best implicit

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[13] When $a, b < 1$, $\partial L / \partial \varphi < 0$ and $\partial L / \partial \psi < 0$ will hold as long as $|\varphi - \psi|$ (and hence $|a - b|$) is not too large. The critical value that $|\varphi - \psi|$ can take decreases in ε (stronger temptation to renege), while it increases in r (more weight on future losses). Note that proposition 6.6 was more general in nature than proposition 6.8.

[14] Say that $c_i(e_i) = {}^1/_m \, e_i^m$. Then proposition 6.8 is valid for all $k \in [{}^1/_2, 1)$ and $\alpha > k$ when $m \geq 1.58$ ($m = 2$ in my model). When investments are very elastic, the increased temptation to renege dominates the increased punishment effect (Halonen 1994).

[15] Note that stronger interdependencies can be good also when asset transfers are expected after an implicit contract violation, but only if investment specificities for the optimal ownership structure under spot governance then increase, so that expected future losses associated with reneging become more important.

contract if φ > ψ (φ < ψ). And, when φ = ψ ≡ k, a smaller k can sustain a first-best contract for higher discount rates. Observe that symmetrical bargaining positions are good to sustain first-best (proposition 6.5), and that first-best is not always sustainable, even if the discount rate is zero (proposition 6.4). The absolute level of the discount rate in figure 2 is not very interesting, since it depends crucially on the technology assumptions of the model (e.g. the form of the cost function and the choice of ε).

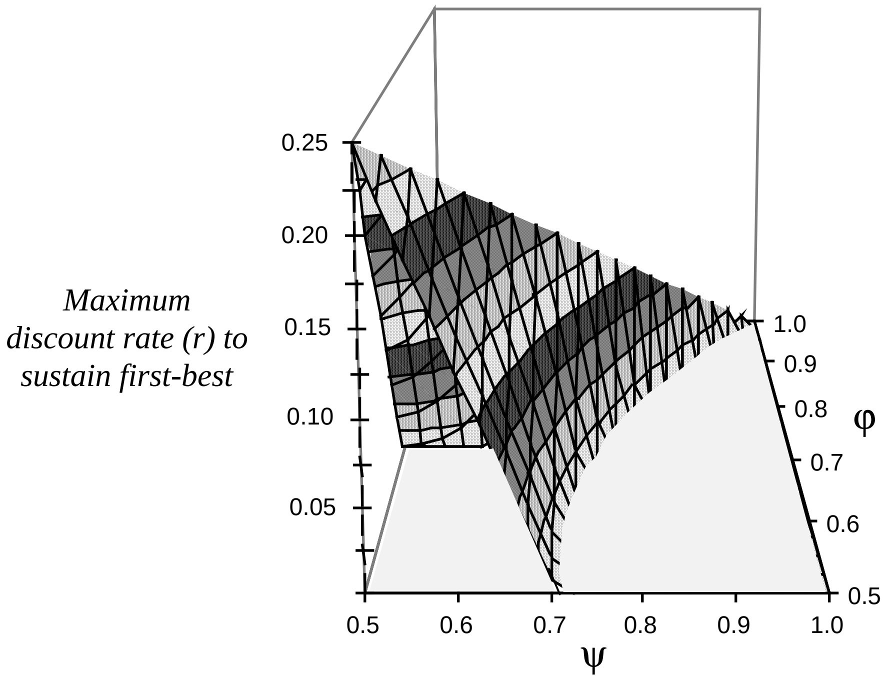

Figure 2.

7. The choice of ownership structure under spot governance

As stated in section 6, the assumptions we have taken so far are not strong enough to rule out any of the ownership structures in the implicit contract mode, and I do not think that such (stronger) assumptions should be taken in a general theory of the firm. However, some more structure with respect to the investment specificity technology can be useful to illustrate some of the results. In this section I develop a model of the investment specificity technology that allows us to compare the different ownership structures under spot governance. In the next section I use this model to construct an example with implicit contracts.

Assume a weak form of symmetry, in the sense that there is a linear relation between the specificities of the two managers' investments[16]

$$\varphi_{T1} = 1 - \tfrac{1}{2}A\eta_1 \qquad \psi_{T1} = 1 - \tfrac{1}{2}\eta_2$$
$$\varphi_{NI} = 1 - \tfrac{1}{2}A\eta_{NI} \qquad \psi_{NI} = 1 - \tfrac{1}{2}\eta_{NI}$$
$$\varphi_{T2} = 1 - \tfrac{1}{2}A\eta_2 \qquad \psi_{T2} = 1 - \tfrac{1}{2}\eta_1$$

where $0 < \eta_1 \leq \eta_{NI} \leq \eta_2 \leq 1$, and $A \in (0, {}^1/\eta_2]$ can be interpreted as a measure of relative investment specificity.[17] η_1 is used when a manager owns both assets, η_{NI} when she only owns one asset and η_2 when she does not own any asset at all.

Setting the expressions for φ and ψ into the expression for the expected joint surplus found in section 3, it is straightforward to show that

(14) $\quad \Omega_{T1} > \Omega_{T2} \quad \Leftrightarrow \quad A > 1$

(15) $\quad \Omega_{T1} > \Omega_{NI} \quad \Leftrightarrow \quad (\eta_{NI}^2 - \eta_1^2)A^2 > \eta_2^2 - \eta_{NI}^2$

(16) $\quad \Omega_{T2} > \Omega_{NI} \quad \Leftrightarrow \quad \eta_{NI}^2 - \eta_1^2 > (\eta_2^2 - \eta_{NI}^2)A^2$

Although outside the core of this paper (and not necessary for the example in the next section), consider some interpretations and special cases of these three results. First, compare integration of type 1 and type 2.

DEFINITION 7.1: Manager 1 has a higher (lower) investment specificity than manager 2 if $A > 1$ ($A < 1$).

PROPOSITION 7.1: If integration is optimal, the manager with the highest degree of investment specificity should own both assets in the spot governance mode.

PROOF: The proposition follows directly from (14) and definition 7.1. QED.

Second, compare integration and non-integration.

DEFINITION 7.2: The two assets are strictly complementary if $\eta_2 = \eta_{NI}$.

Then one asset is of no value if it cannot be used together with the other asset.

PROPOSITION 7.2: If the assets are strictly complementary in nature, some type of integration (weakly) dominates non-integration in the spot governance mode.

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[16] Since cross ownership and joint ownership are dominated by non-integration in the spot governance mode, those ownership structures are ignored in this section.

[17] The following results are insensitive to a positive linear transformation of the investment specificity technology, in the sense that we could replace η_j with $\delta\eta_j$, where $j \in \{1, NI, 2\}$ and $\delta \in (0, {}^1/\eta_2]$.

PROOF: If the assets are strictly complementary in nature, we can substitute η_{NI} for η_2 in (15) and (16), which then imply

$$\Omega_{T1} \geq \Omega_{NI} \quad \Leftrightarrow \quad \eta_{NI} \geq \eta_1$$
$$\Omega_{T2} \geq \Omega_{NI} \quad \Leftrightarrow \quad \eta_{NI} \geq \eta_1$$

The inequalities on the right hand side are by definition satisfied, hence T1 and T2 both (weakly) dominate NI. QED.

Finally, consider a situation where a manager is essential to an asset, so that the other manager cannot gain from owning that asset (if the two managers do not cooperate).

DEFINITION 7.3: A manager is essential for the asset most specific to her investments if $\eta_1 = \eta_{NI}$.

PROPOSITION 7.3: Non-integration (weakly) dominates integration in the spot governance mode, if both managers are essential with respect to the asset most specific to each manager.

PROOF: If both managers are essential for the asset most specific to their own investments, we can substitute η_{NI} for η_1 in (15) and (16), which then imply

$$\Omega_{T1} \leq \Omega_{NI} \quad \Leftrightarrow \quad \eta_2 \geq \eta_{NI}$$
$$\Omega_{T2} \leq \Omega_{NI} \quad \Leftrightarrow \quad \eta_2 \geq \eta_{NI}$$

The inequalities on the right hand side are by definition satisfied, hence T1 and T2 are both (weakly) dominated by NI. QED.

In this section I have demonstrated that non-integration dominates integration in the spot governance mode if each manager is essential to the use of *her* asset, while the opposite is the case if the assets are strictly complementary in nature. The manager with the highest investment specificity will then own both the assets.

Since Hart and Moore (1990) and Hart (1995) have already provided us with excellent insights on the choice of ownership structure in the spot governance mode, I have kept my analysis in this section on a rather superficial level. Note that proposition 7.2 is a variation of proposition 6 in Hart and Moore (1990) and proposition 2(E) in Hart (1995 ch.2), while proposition 7.3 corresponds to proposition 8 in Hart and Moore (1990) and proposition 2(D) in Hart (1995 ch.2).

8. An example

Assume the investment specificity technology of section 7. Set $\eta_1 = 0.30$, $\eta_{NI} = 0.38$, $\eta_2 = \eta_{JO} = 0.50$ and $\varepsilon = ½$. Manager 2's bargaining positions (i.e. her incentives) under the different ownership structures are then fixed in the spot governance mode

$$\psi_{T1} = \psi_{JO} = 0.75, \quad \psi_{NI} = 0.81 \quad \text{and} \quad \psi_{T2} = 0.85.$$

Since I have argued that implicit contracts are not likely to include fixed transfers, assume that this is the case (i.e. t = 0 as in section 6). The managers choose the governance structure (ownership structure and governance mode) that maximises expected joint surplus.

Figure 3 shows how the optimal governance structure then is jointly determined by the relative investment specificity (A) and the discount rate (r).

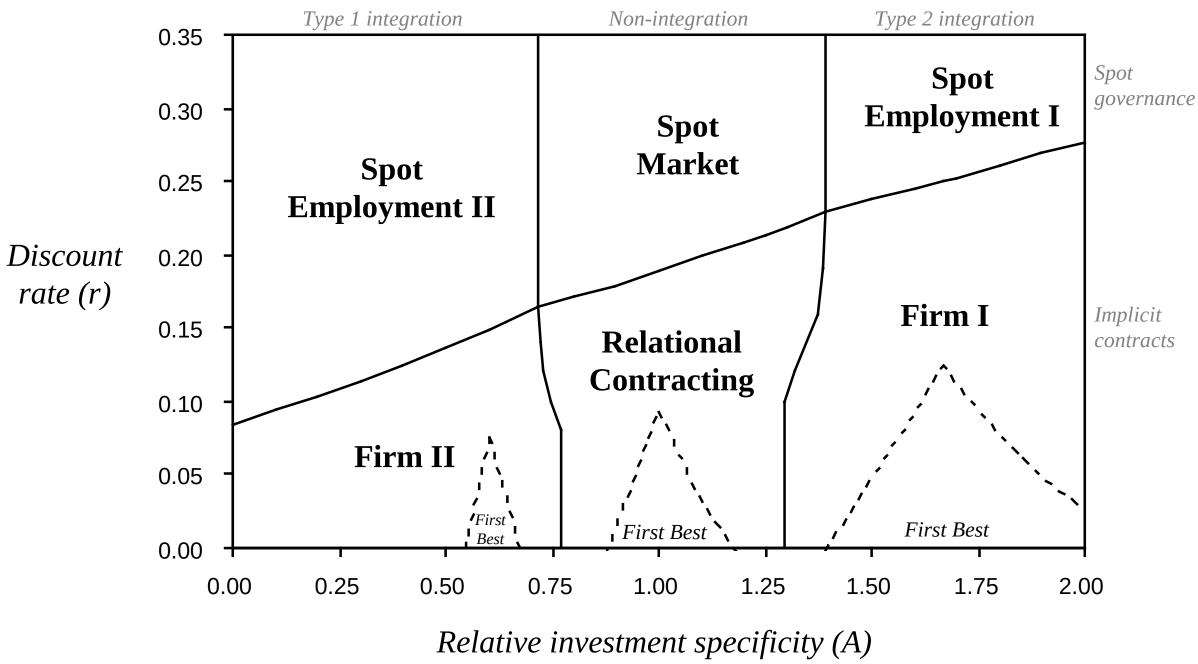

Figure 3.

As stated in proposition 6.3, irrespective of investment technology, an implicit contract can always be found that outperforms spot governance when the discount rate is sufficiently low (i.e. the parties are sufficiently patient). However, first-best is not always sustainable, even if the discount rate goes to zero (proposition 6.4).

The two managers' bargaining positions are equal for three values of the relative investment specificity parameter A: $A = \eta_1/\eta_2 = {}^3/_5$ (under T2), A = 1 (under NI, CO and JO) and $A = \eta_2/\eta_1 = {}^5/_3$ (under T1). First-best can be achieved only if A is close to these values (and the corresponding ownership structure is chosen). Exactly equal bargaining positions are superior with respect to how impatient the parties can be (proposition 6.5).

For high discount rates, no self-enforcing implicit contract exists. The indifference curves between spot employment (I and II) and spot market are found from (15) and (16) in section 7. The investment specificity technology is defined so that going from spot employment to spot market, the positive effects of one manager's strengthened incentives outweigh the negative effects of the other manager's weakened incentives when A is close to 1. With more asymmetrical technologies, so much can be gained by letting the manager with the highest investment specificity own both assets, that spot employment dominates spot market. Her incentives to invest are then much more sensitive to transfers of ownership rights than the incentives of the other manager.

For a given technological setting (here denoted by a specific A), the same ownership structure tends to maximise the expected joint surplus under both spot governance and implicit contracts, since strong bargaining positions are good under both governance modes (proposition 6.6). However, an ownership structure with more symmetrical bargaining positions can under some settings sustain a better implicit contract, although the expected joint surplus under spot governance does go down. This is typically the case when the optimal ownership structure under spot governance would have implied that one of the managers had to be given incentives to over-invest in the corresponding implicit contract.

In the example, more symmetrical bargaining positions are obtained by choosing integration for a larger range of A under implicit contracting than under spot governance. With other values of η_1, η_2 and η_{NI} it could be the other way around. In fact, for sufficiently large η_{NI}, non-integration would be dominated by integration under spot governance for all values of A, while relational contracting still could dominate firms.

The indifference curve between spot governance and implicit contracts is influenced by the overall level of efficiency loss due to relation- and asset-specificity. The way the example is constructed, the specificity of manager 1's investments increases as A increases, while the specificity of manager 2's investments is constant. In other words, the overall efficiency loss in the spot governance mode increases going from left to right in the diagram. The potential gains of implicit contracts are then larger, and an implicit contract is self-enforcing for higher discount rates (Baker, Gibbons and Murphy 1996).

Compare the three areas where first-best is possible. Note that the area to the right (where the overall efficiency loss is higher) is larger than the other two areas. This illustrates the same phenomenon that we saw in proposition 6.8 and figure 2. Technologies with higher interdependencies can be good, although the returns on investments remain the same.

Relational contracting dominates mutual hostage taking and partnerships for all (A, r) in this example, due to the linear relation between the specificities of the two mangers' investments. However, partnerships become more interesting if there, for all practical purposes, is only one asset to own. That is often the case, either because the assets are very complementary in nature, or because the asset is indivisible. Then non-integration (and cross ownership) are not relevant. In the spot governance mode, joint ownership will be dominated by spot employment as before. However, partnerships can dominate firms. This is illustrated in figure 4, where the assumptions otherwise are the same as in figure 3.[18]

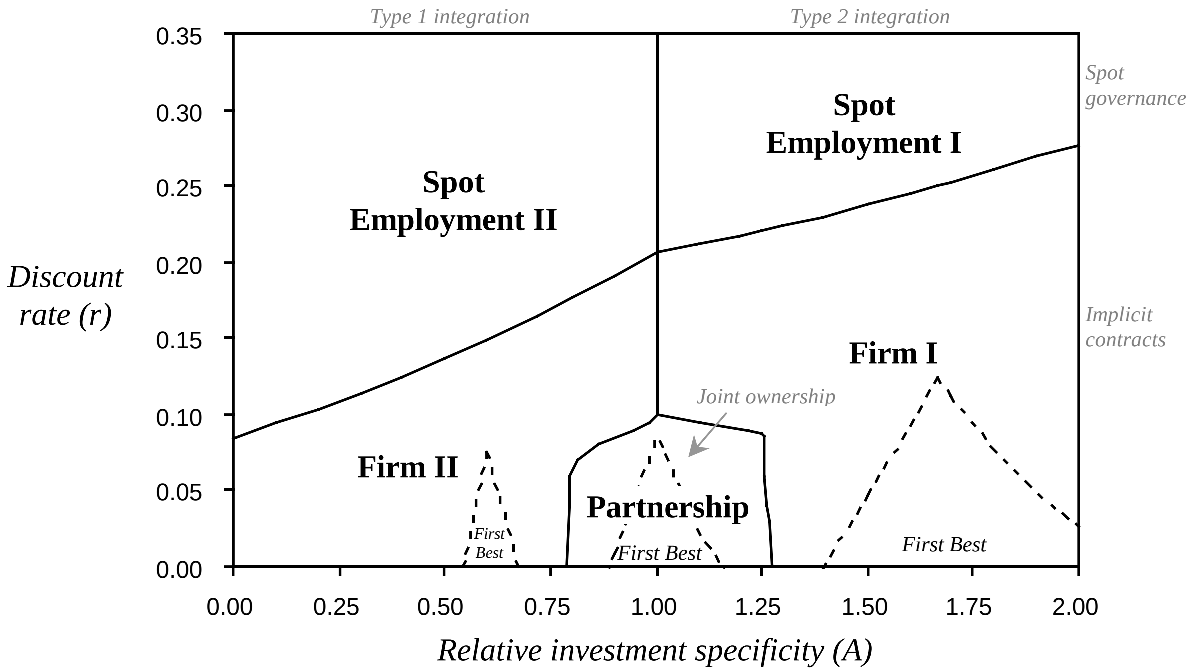

Figure 4.

Settings where the two parties have similar technologies, they take a long-term perspective and there is only one asset to own, are favourable to partnerships. These conditions seem to be satisfied for many law and management-consulting firms (where the only significant asset is the company name), which indeed often are jointly owned by active partners.

Of course, the size of the area in figure 4 where partnership dominates firms depends on the parameter setting. Partnership will be the optimal structure under a larger range of (r, A), if for instance η_1 is reduced (while the other parameters remain the same), since the regions for first-best under Firm I and Firm II then will be further away from A = 1.

9. Concluding remarks

The paper aims at developing a richer logical framework for discussing basic corporate governance questions. In my dynamic model, ownership structures such as joint ownership (and cross ownership) can be justified based on rational (economic) reasoning, while in more static models there is usually no room for such structures.

[18] η_1 is now used when a manager owns the single asset, and η_2 (= η_{JO}) is used when she does not own it.

I show that ownership in general does matter also when the parties to some degree are disciplined by reputation effects. In fact, that can be the case even if the parties are infinitely patient. Although the same ownership structure tends to be optimal both under spot governance and implicit contracts, another structure can be chosen if it leads to more equal bargaining positions. This can explain why long-term partners that otherwise seem very similar, often also have symmetrical ownership rights. Either they own a firm together on equal terms (partnerships), or they work together on a long-term basis as two separate firms (relational contracting).

The bargaining positions (resulting from the level of investment specificity) can be influenced not only by the ownership structure but also by the initial choice of technology. In some settings, the parties will benefit from increasing the technical interdependencies to weaken the bargaining positions. Note that such technology may also generate higher expected returns, which normally is the main reason for introducing investment specific technology in the first place.

To focus on the fundamental issues of investment specificity, I have used a very simple modelling technology. Still, I am able to develop more realistic predictions than Baker, Gibbons and Murphy (1996) with respect to firms versus relational contracting, since both parties invest in my model. The model is flexible in the sense that it is valid for any number of assets, and it can easily be extended to more than two parties. For instance, if there are three parties, the renegotiation process can be defined so that each party gets $^1/_3$ of the added surplus, or one can use the Shapley value as solution concept (Hart and Moore 1990). Note that a manager in the model can be seen as a business unit or a large firm.

The model seems realistic in a bounded rationality perspective, since the structure of the managerial decisions is quite simple. In an implicit contract mode, they only have to choose an ownership structure and agree upon a way to split the joint surplus according to how they *feel* that each manager has contributed to the joint surplus. However, if the implicit contract was to include a fixed transfer, the managers would have to perform more conscious calculations, since the fixed transfer can work only when it is agreed upon and understood ex-ante.

To simplify the analysis, I let the joint surplus depend additively on the two managers' investments, so that the implicit contract could be based on the value added of each manager. Theoretically this is not very different from a situation where the implicit contract is based on two other observable signals which depend on both the two managers' efforts. From a more practical point of view, it is only important that the two managers are able to split the joint surplus in a way that they both agree is *fair* in every period based on commonly observed information. Note that under spot governance (where no *trust* is needed) the two managers do not need to split the joint surplus generated by cooperation, since only the total joint surplus is used in the renegotiations.

Like Baker, Gibbons and Murphy (1996), I do only consider a quadratic cost function. This is of course a very special case. On the other hand, most of the results seem robust with respect to the form of the cost functions (and the benefit functions), as long as these are symmetrical for the two managers.[19] However, if one of the managers has higher or more rapidly increasing marginal costs, then that would typically favour the other manager as asset owner.

I have ignored the haggling costs associated with the different governance structures (Williamson 1985). One would expect these costs to depend on the relative bargaining positions of the two parties. It seems natural to believe that symmetrical bargaining positions (as well as very extreme asymmetrical positions) are good for the haggling process, since symmetry (in the negotiation outcome) is a powerful focal point (Schelling 1960). If that is the case, symmetrical bargaining positions can reduce both the hold-up problem (under implicit contracts without fixed transfers) and the haggling costs.

This paper is of course only interesting if the hold-up problem as such is important for asset ownership. In my opinion, it must be relevant with respect to the build-up of capabilities and firm resources, since such investments typically are firm specific in nature. And judging by the attention given to such aspects of the firm in recent strategy literature, the success of a company depends to a very large degree on these investments. However, ownership can also be important for the information structure, the operational efficiency and the market position.

I have focused on asset ownership and a particular form of trust based on economic arguments. One could also imagine that explicit contracts could be used to reduce the hold-up problem (see Bragelien 1998). Other forms of authority based on contracts or social mechanisms can also play important roles, and there are important aspects of trust (as social mechanism) that are not captured in the model.

Despite the focus on asset ownership, the model can be used in a more general setting, where other types of decision rights will influence the ex-post bargaining positions as well. For example, a manager or a unit can be given the right to decide on product modifications (or at least a right to veto such changes), irrespective of asset ownership. The more decision rights there are to distribute, the more flexibility the parties have in finding a governance structure with symmetrical bargaining positions that can support a good implicit contract.

[19] I have already repeatedly commented on the exception, proposition 6.8.

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Greek letters used in the paper:

γ - gamma	Investment specificity factor for manager 1
λ - lambda	Investment specificity factor for manager 2
φ - cphi	Ex-post bargaining position for manager 1
ψ - psi	Ex-post bargaining position for manager 2
θ_i - theta	Net value added by a manager i
Ω - Omega	Expected joint surplus for a period under spot governance
Δ - Delta	Discounted value added from a transfer of ownership rights
η - eta	Investment specificity parameter