Contracting for Control

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Abstract

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1. Introduction

From Coase (1937) to Williamson (1971) to Grossman and Hart (1986) and beyond, economists have understood that transferring asset ownership is one way to transfer control. In practice, however, firms can and do transfer control without transferring asset ownership (i.e., without mergers, acquisitions, divestitures, or the like), using contracts that move decision rights across fixed firm boundaries. For example, Lerner and Merges (1998) analyze 25 decision rights that can be allocated to either partner in contracts between pharmaceutical firms and biotechnology companies, such as the right to control patent litigation or the right to manufacture the final product. Similarly, Arruñada, Garicano, and Vasquez (2001) study the allocation of 33 decision rights in contracts between auto manufacturers and their dealers, such as the right to determine the size and qualifications of the sales force or the right to set prices. Likewise, Elfenbein and Lerner (2003) investigate the allocation of decision rights in contracts between internet portal operators and content suppliers, such as the right to determine the “look and feel” of the website.

The diversity of settings studied in this empirical work (as well as even brief inspection of industries such as medical devices, airlines, and telecommunications) suggests that it is common for firms to use contracts to move decision rights across their boundaries. And yet, in our view, the existing literature has neither fully characterized the economic environments in which some of these contracts are written nor fully explored the forces that cause firms to choose particular contract terms in such environments. In this paper, therefore, we develop both a new model of the economic environment in which such contracts often are written and
a new analysis of the forces that cause firms to choose particular contract terms in such environments.

To model the allocation of decision rights via contracts that move decision rights across fixed firm boundaries, one could begin from the “incomplete contracts” approach to the theory of the firm pioneered by Grossman and Hart (1986) and Hart and Moore (1990) (hereafter GHM). While the language and applications in these two GHM papers focused on changes in firms’ boundaries (i.e., changes in asset ownership, such as acquisitions and divestitures), it is natural to reinterpret the GHM model in terms of contracts that move decision rights across fixed firm boundaries (along the lines of Aghion and Tirole (1994), for example).

An important assumption in the GHM model (whether applied to asset ownership or to contract terms) is that decisions are contractible ex post. That is, decisions cannot be conditioned on the uncertain state of the world before it is realized, so contracts are incomplete ex ante, but once the state has been realized, contracting on a particular decision is feasible. Because decisions are contractible ex post, once the state is revealed, the parties negotiate over both the decision that the party in control should choose and an accompanying side-payment. The Coase Theorem applies, so these negotiations produce the Pareto-efficient decision, regardless of which party is in control. That is, in the GHM model, the allocation of decision rights does not affect which decision is taken ex post. On the other hand, the allocation of decision rights does affect the accompanying side-payment, which in turn affects the parties’ incentives to undertake ex ante specific investments. In short, the GHM model prescribes assigning decision rights so as to optimize the ex ante specific investments induced by ex post side-payments.

In this paper we depart from the GHM assumption that decisions are contractible ex post. Because in our model decisions are not contractible ex post, the parties cannot negotiate over the decision after the state is revealed; instead, the party in control simply takes her self-
interested decision, and the allocation of decision rights does affect which decision is taken ex post. Thus, our model prescribes assigning decision rights so as to optimize ex post decisions.

Our focus on assigning decision rights so as to optimize ex post decisions allows us to study settings in which the parties do not make specific investments. In particular, we reconsider an important problem first studied by Simon (1951): adaptation as uncertainty is resolved. To introduce our model, recall Simon’s simple set-up. There are two parties, a boss and a subordinate, both of whom care about a decision, d, that can be taken after a state, s, is realized. The surplus-maximizing decision in state s is d*(s), but contracts are incomplete, so the parties cannot write the contract d*(s) ex ante and enforce it ex post. Instead, Simon assumes that the parties’ options are either to lock in a decision, d_0, before the state is realized or to allow the boss to choose her self-interested decision, d_b(s), after the state is realized. Under intuitive conditions (roughly, the variance of s is low and the parties’ interests are poorly aligned), it is efficient to lock in a decision ex ante; under the opposite conditions (high variance and well-aligned interests), it is efficient to allow self-interested adaptation ex post. In the latter case, Simon is proposing a very simple governance structure for adaptation: let the boss decide. Importantly, Simon also briefly considered an alternative governance structure (namely, let the subordinate decide, p. 304), and he even considered the possible role of repeated interactions in moving a decision-maker’s decisions away from short-run self-interest and towards Pareto-efficiency (p. 302).

Because we analyze environments where decisions are not contractible ex post (not to mention ex ante), our version of Simon’s model compares self-interested decision-making by the boss to self-interested decision-making by the subordinate (rather than to a decision locked in ex ante). Our model also generalizes Simon’s by allowing an arbitrary number of

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1 Our formulation thus resolves an implicit tension in Simon’s analysis: Simon does not explain why, if the decision is contractible ex ante, it is not also contractible ex post. If the decision were contractible ex post, then the parties could renegotiate the boss’s self-interested decision ex post and the allocation of decision rights ex ante would be immaterial.
parties and an arbitrary number of alienable decision rights, each of which can be allocated to any party, as well as an arbitrary number of inalienable decision rights that cannot be reallocated. We define a governance structure to be an (ex ante) allocation of alienable decision rights across the parties, and we solve for the governance structure that maximizes expected social surplus in a spot-adaptation setting. We then analyze the repeated interactions that Simon envisioned, using the theory of repeated games to model relational contracts that allow the parties to improve upon the “Nash adaptation” that occurs in a spot setting. We describe why and how the optimal governance structure in a relational setting differs from that in a spot setting.

Although we share Simon’s interest in the adaptation problem, we depart from his focus on the employment relationship. Instead, we see our model as studying interactions between firms, rather than within. In particular, by interpreting our model in terms of contracts that move decision rights across fixed firm boundaries, we provide a formal analysis of an intriguing argument by Klein (2000). Based on decades of experience with the design and implementation of contracts between firms, Klein notes that “although Macaulay and others are correct in noting that many business relationships are self-enforced, transactors are not indifferent regarding the contract terms they choose to govern their self-enforcing relationships” (p. 68). Klein then asserts that the “fundamental economic motivation for the use of court-enforceable contract terms is to supplement self-enforcement” (p. 73). More specifically, Klein argues that “contract terms cannot be understood without recognizing that their role often is to control [the total reneging temptation] so that it remains below [the surplus created by the relationship]” (p. 73).

\[\text{In our 1999 paper, we argued that, within organizations, control resides at the top. As a result, within organizations, decision rights can only be loaned to subordinates, not owned by them. Thus, while it makes sense to analyze which of two firms should own a decision right, as we do in this paper, it is at best a reduced-form approach to interpret the same analysis as applying to two organization members.}\]
In our model, the optimal allocation of decision rights is completely consistent with the considerations that Klein describes. More specifically, in the relational-contracting environment we analyze, the optimal governance structure for implementing a given decision rule is the governance structure that minimizes the maximum aggregate temptation to renege on the decision rule. To develop this result, in Section 3 we present an elemental version of our model, where two parties can allocate a single decision right ex ante but cannot contract on decisions ex post, and where specific investments play no role. We also present two examples of our model, in the context of a strategic alliance between a large pharmaceutical company and a small biotech firm, and we describe why and how the optimal governance structure in a relational setting differs from that in a spot setting. Then, in Section 4, we develop and analyze a much richer version of our model, which preserves the intuition developed in Section 3. Our formal analysis thus confirms Klein’s informal arguments and also elucidates several aspects that went unnoticed in the informal account.

While we emphasize our model’s departure from the GHM model’s specific assumption that decisions are contractible ex post, we also acknowledge our paper’s debt to the larger Grossman-Hart-Moore incomplete-contracts approach. Therefore, before developing our elemental and richer models in Sections 3 and 4, we first offer perspectives in Section 2 on both the specific GHM model and the larger Grossman-Hart-Moore incomplete-contracts approach. We conclude the paper in Section 5 with a literature review and discussion of future work.

2. Perspectives on the GHM Model and Incomplete-Contracts Approach

In this section we offer three perspectives. First, to fix ideas and terminology, in Section 2A we develop an elemental GHM-style model. Then, to compare that model to the evidence, in Section 2B we summarize three recent empirical papers concerning contracts
that move decision rights across fixed firm boundaries. Finally, to distinguish between the specific GHM model and the larger Grossman-Hart-Moore incomplete-contracts approach, in Section 2C we discuss some of the contributions of the larger approach.

2A. An Elemental GHM-Style Model

This sub-section develops a simple GHM-style model that can be compared to the evidence summarized in Section 2B. We emphasize that this is a GHM-style model (with specific investments and decisions that are contractible ex post), not an example of our approach (without specific investments and with decisions that are not contractible ex post). The timing of the GHM-style model is as follows:

(i) two parties negotiate over control of a decision right;
(ii) the parties simultaneously choose actions, with party i choosing action \( a_i \in A_i \) at cost \( c_i(a_i) \);
(iii) the parties observe both the actions \( (a_1, a_2) \) and the state of the world, \( s \in S \);
(iv) the parties negotiate over both the decision, \( d \in D \), that the party with control should choose and the accompanying side-payment, \( p \), that should be made to the party who has control;
(v) the parties receive their payoffs, \( U_i(a_1, a_2, s, d) \) for \( i = 1, 2 \) (where \( U_i \) is gross of any negotiated payments and action costs).

The actions \( (a_1, a_2) \), the state \( s \), and the payoffs \( (U_1, U_2) \) are non-contractible. The decision \( d \) is non-contractible in stage (ii) but becomes contractible in stage (iv) after the state is revealed in stage (iii).

This timing may seem somewhat different from the GHM model, but in fact this timing merely surfaces elements of that framework that have become informal or implicit as the GHM model has been distilled over time. For example, Hart and Moore (1990) and Hart (1995) informally discuss but do not formally model the decision \( d \) that is contractible in stage (iv) but not in stage (ii), whereas Grossman and Hart (1986) formally model such a decision (which they denote by \( q \)). Similarly, none of these presentations formally models
the state \( s \), although all of them informally discuss the role of \( s \) in making \( d \) non-contractible in stage (ii), and Grossman and Hart devote footnote 14 to sketching such a model.

The intuition behind this model is that the allocation of control in stage (i) determines the negotiated allocation of surplus in stage (iv), which determines investment incentives in stage (ii). But this coarse account obscures the subtle mechanism that determines the optimal allocation of control in the GHM model, as follows. In stage (iv), the parties bargain to the efficient decision, conditional on the observed actions and state, \textit{regardless} of which party controls the decision. Nonetheless, the allocation of control does affect the parties’ payoffs in stage (iv), because the negotiation in that stage determines not just the decision \( d \) but also the payment \( p \) to the party who has control (to induce that party to take the efficient decision rather than that party’s self-interested decision). In short, the subtle mechanism underlying the GHM model is that the allocation of control in stage (i) affects the parties’ actions in stage (ii) by affecting how these actions influence the negotiated payment \( p \) in stage (iv). For more details, see Appendix 1.

\[ 2B. \quad \textit{Recent Evidence on the Assumptions and Predictions of the GHM Model} \]

In this sub-section we summarize our examination of three recent empirical papers that explore the allocation of decision rights across fixed firm boundaries: Lerner and Merges (1998), Elfenbein and Lerner (2003), and Arruñada, Garcicano, and Vazquez (2001). We ask whether (1) the qualitative descriptions of the contracting environment fit the assumptions of the GHM models and (2) the quantitative analyses of who controls which decisions match the predictions made by these models.

We begin by assessing whether the contracting environment described in these papers reflects the assumptions of the GHM models. We first ask whether there are non-contractible actions that importantly affect the value of the relationship. In all three papers, the authors stress the importance of non-contractible actions that affect the value of the relationship. \textit{But}
the GHM model requires more than the presence of important non-contractible actions: in addition, it must be that these ex ante actions could be influenced by the ex ante contractual allocation of ex post decision rights (i.e., in the elemental model in Section 2A, the allocation of control in stage (i) determines the negotiated allocation of surplus in stage (iv), which determines investment incentives in stage (ii)). A more detailed examination of these papers, and a more careful mapping of the environments they describe onto our simple model in Section 2A, shows that the relationship between the non-contractible actions and the allocated decision rights often does not conform to the assumptions of the GHM framework.

Having considered whether the contracting environments described by these three papers correspond to the assumptions of the GHM model, we turn next to the quantitative analyses reported in these papers, to see whether they support the GHM predictions about the optimal allocation of decision rights. As emphasized in Section 2A, the predictions of the GHM model depend on a subtle mechanism. In brief, we find that none of the three papers provides much support for the proposition that the ex ante allocation of ex post decision rights is importantly influenced by the desire to improve the ex ante choice of specific investments.

Our examination of these three empirical papers suggests that neither the assumptions nor the predictions of the GHM-style models are entirely satisfying. (See Appendix 2 for more details.) The spotty correspondence between the contracting environments described in these papers and the assumptions of the GHM framework suggests that there is room for a new conception of the issues at play here. Similarly, the modest empirical support that these empirical papers provide for the predictions of the GHM model (at least with respect to the allocation of decision rights across fixed firm boundaries) again suggests that there is room for a new approach. Of course, our conclusion from these three papers does not preclude the possibility that other evidence from other settings might be fully consistent with both the assumptions and the predictions of the GHM approach.
2C. The GHM Model and the Incomplete-Contracts Approach

We now distinguish between the specific assumptions of the GHM model versus the larger contributions of the Grossman-Hart-Moore incomplete-contracts approach. In particular, while we emphasize our model’s departure from the GHM model’s assumption that decisions are contractible ex post, we also acknowledge our paper’s debt to the larger Grossman-Hart-Moore incomplete-contracts approach.

As is true of many seminal papers (such as Spence’s (1973) signaling model, for example), the overall contribution of the original papers by Grossman and Hart (1986) and Hart and Moore (1990) derives partly from the advances they achieved and inspired in their original substantive domain (namely, the Coasean make-or-buy problem) but also importantly from their role in inspiring parallel models in alternative substantive domains. For example, the GHM models inspired parallel models concerning internal versus external capital markets (Gertner, Scharfstein, and Stein, 1994), debt versus equity (Dewatripont and Tirole, 1994), intra-firm versus inter-firm international trade (Antras, 2003), public versus private provision of services (Hart, Shleifer, and Vishny, 1997), and more. But, important as these parallel models in alternative domains are in assessing the overall contribution of the larger GHM approach, our view is that the original GHM models (and, in particular, their specific assumption that decisions are contractible ex post) played an important role in narrowing the focus of these parallel models. To abuse a metaphor, if the GHM approach launched 1000 ships, the GHM models steered most of them in a particular direction.

Indeed, it may be that the GHM models importantly narrowed the focus especially in their original substantive domain. For example, in comparing transaction-cost economics (TCE) to the GHM models, Williamson (2000: 605) argues that: “The most consequential difference between the TCE and GHM setups is that the former holds that maladaptation in the contract execution interval is the principal source of inefficiency, whereas GHM vaporize ex post maladaptation by their assumptions of common knowledge and costless ex post
bargaining. The upshot is that all of the inefficiency in GHM is concentrated in the ex ante investments in human assets (which are conditional on the ownership of physical assets).” We believe that by dropping the GHM assumption that decisions are contractible ex post, and by focusing on the problem of moving decision rights by contract, we are helping to reopen exploration of the “maladaptation in the contract execution interval” that we see Williamson as right to emphasize.

3. An Elemental Model of Adaptation

In this section and the next, we develop a complementary model of “contracting for control.” We interpret this model as describing the use of contracts in which firms move decision rights (and money) across fixed firm boundaries, in order to facilitate adaptation. To focus on this adaptation problem, we ignore specific investments. (Stated more abstractly, we ignore ex ante inalienable non-contractible actions such as those in stage (ii) of the model in Section 2A.) In this section, we develop and analyze an elemental version of the model, with only two parties, one alienable decision right, and no inalienable decision rights. We also build intuition via two examples. In the next section, we develop and analyze a richer version of the model—with many parties, many alienable decision rights, and many inalienable decision rights—that preserves and extends the intuition we develop here.

3A. Modeling Decisions versus Decision Rights

As the simplest example of our model, we begin with a single decision right that can be assigned to either of two parties, A and B, who are risk-neutral and have private (inalienable) benefits $\pi_A$ and $\pi_B$, respectively. These private benefits depend on the state of nature, drawn from the finite set $S$ according to the probability density $f(s)$, and also on the decision $d$,
chosen from the finite set $D$ after the state is revealed. First-best state-dependent decision-making therefore is given by

$$d^{FB}(s) \equiv \arg\max_{d \in D} \pi_A(d,s) + \pi_B(d,s),$$

which produces the total payoff in state $s$

$$V^{FB}(s) \equiv \pi_A(d^{FB}(s),s) + \pi_B(d^{FB}(s),s)$$

and the expected total payoff $V^{FB} \equiv E_s[V^{FB}(s)].$

We assume that the state and the decision are observable to both parties but not verifiable by third parties. In particular, in a departure from the GHM approach, we assume that the decision $d$ is not contractible even after the state $s$ has been observed. On the other hand, we assume that the *right* to make the decision is contractible even before the state is observed. If Party $i$ ($i = A, B$) has the decision right and observes state $s$, then Party $i$ would like to choose the decision that maximizes its own private benefit, without regard to the private benefit of Party $j$:

$$d^*_i(s) \equiv \arg\max_{d \in D} \pi_i(d,s),$$

which produces the total payoff in state $s$

$$V^i(s) \equiv \pi_A(d^*_i(s),s) + \pi_B(d^*_i(s),s)$$

and the expected total payoff $V^i \equiv E_s[V^i(s)].$ Note that our assumption that the decision is not contractible ex post implies that the parties cannot negotiate over this decision, in the sense of agreeing to have the party in control choose a different decision in exchange for a suitable side-payment.

In this elemental model, there are only two feasible governance structures: either Party A has the decision right or Party B has it. We assume that the decision right cannot be
reallocated after the state is revealed but before the decision is taken—say, because the state is realized at a random moment, after which a decision must be taken quickly, else all value is lost. Therefore, if the parties are engaged in a one-shot transaction (the “spot” case, as opposed to the “relational” case below), then Party A should hold the right if $V^A > V^B$, whereas B should hold the right if $V^B > V^A$. Let $V_{SP} \equiv \max\{V^A, V^B\}$ denote the expected total surplus produced by the optimal spot governance structure.

Ignoring special cases in which the parties’ interests are perfectly aligned, spot governance is not efficient ($V_{SP} < V_{FB}$), so it is natural to ask whether the parties can do better. The decision and state are not verifiable by third parties, so formal contracts (i.e., those enforced by the courts) are not feasible. But the decision and state are observed by the two contracting parties, so relational contracts (i.e., those enforced by the parties’ concerns for their reputations) may be feasible. In particular, if the parties interact repeatedly over time, then they may be able to use a relational contract (formally, a subgame-perfect equilibrium of the repeated game) to implement a decision rule $d_{RC}(\cdot)$ that outperforms the optimal spot governance structure by producing the expected payoff

\[ V(d_{RC}(\cdot)) = E_s[\pi_A(d_{RC}(s),s) + \pi_B(d_{RC}(s),s)] > V_{SP}. \]

A relational contract can specify not only a decision rule $d_{RC}(\cdot)$, but also payments that may help induce the party who has the decision right to take the intended decisions. Such payments are similar to the subjective bonus payments analyzed in agency models by Bull (1987), MacLeod and Malcomson (1989), Levin (2003), and others. As in those models, we must analyze whether it is in the payer’s interest to make such payments. In our model, however, we must also analyze whether the party who has the decision right will use it in the intended fashion. For example, if Party i has the decision right and state $s$ occurs, then Party i will be tempted to take the self-interested decision $d^*_i(s)$ given in (3), which may differ from the intended decision $d_{RC}(s)$.
Given the decision rule $d^{RC}(\cdot)$, define Party $i$’s reneging temptation in state $s$ by

\[(6) \quad R_i(s) \equiv \pi_i(d^*_i(s), s) - \pi_i(d^{RC}(s), s).\]

In Proposition 1 in Section 4, we show that if Party $i$ has the decision right, then the parties can implement the decision rule $d^{RC}(\cdot)$ if and only if

\[(7) \quad R_i \equiv \max_s R_i(s) \leq \frac{1}{r}\left(V(d^{RC}(\cdot)) - V^{SP}\right),\]

where $R_i$ is the maximum reneging temptation that Party $i$ faces over all $s \in S$, $r$ is the interest rate per period in the repeated game, and $V(d^{RC}(\cdot)) - V^{SP}$ is the surplus created by the relational contract (i.e., the increase in the expected total payoff produced by using the relational contract instead of optimal spot governance). In short, given a particular governance structure, a decision rule can be implemented via a relational contract if and only if its maximum reneging temptation is less than the present value of the surplus it creates.

Our Proposition 1 parallels results in MacLeod and Malcomson (1989) and Levin (2003). But those models allow only one governance structure, so they analyze how relational contracting can improve on spot transacting within that single governance structure. Our model, in contrast, has multiple governance structures (in this section, two; in the next, many), so we focus on how one governance structure can facilitate better relational contracts than another can. For example, for certain parameters, one governance structure can facilitate the first-best decision rule, whereas no other governance structure can do so. Similarly, for other parameters, no governance structure can facilitate the first-best decision rule, but one governance structure can facilitate the second-best decision rule (producing the highest feasible $V(d^{RC}(\cdot))$ and exceeding $V^{SP}$), whereas no other governance structure can do so. We turn next to examples of these two kinds.
3B. Examples of Relational Adaptation

In this subsection we present two examples that provide intuition about the determination of optimal governance structures (contracts for control) and show how adaptation is affected by the allocation of decision rights in spot and repeated transactions. Both examples involve simple settings in which one party controls a single decision right. In such settings, the problem is to determine who should control this single decision right.

Both examples examine who should hold the decision rights over the marketing of a new drug developed in a strategic alliance between a large pharmaceutical company and a small biotech firm. The question is who should make the day-to-day decisions about how to market the drug. The pharmaceutical company cares only about the revenues from the drug, and would like to market the drug in ways that maximize these revenues. However, the biotech firm could learn from the marketing, and so would like to do marketing to increase this learning. Doing marketing in the way preferred by the pharmaceutical company maximizes the revenues from the drug, while doing marketing the biotech’s way maximizes its learning, at some cost to revenue. The specific day-to-day decisions about how to market the drug are not contractible, and they vary in importance. In some states of the world, correlating roughly with the complexity of the marketing task on that day, the importance of doing marketing pharma’s way is very important, on other days this is less so. The value of learning to the biotech also varies positively with the complexity of the marketing task.

In our first example, learning is very important to the biotech. As a result, the value to both parties of controlling the marketing increases as the complexity of the tasks increase (though this value increases more quickly for the pharma firm than for the biotech). Thus in this example, the two firms disagree both over how the marketing should be done, and over how important doing it their way is across states of the world. The figure below shows the net benefits to each party of doing marketing its way, for different states of the world relating to the complexity of the marketing task. For each firm, the payoffs shown are the gross
benefits it would get from doing marketing its way minus the gross benefits it would get from doing marketing the other firm’s way: \( N_i(s) = \[\pi_i(d_i^*(s), s) - \pi_i(d_j^*(s), s)\] \) The figure is drawn such that the value of learning is, on average, higher to the biotech: \( E[N_B(s)] > E[N_P(s)] \). This implies that if the parties interact in a series of spot transactions, it is more efficient for the biotech to control the day-to-day marketing decisions.
First-best decisions are those that maximize the sum of the net benefits to the two parties. In this example, the first-best decision rule would be to do marketing biotech’s way in all states $s<s^*$, and do it pharma’s way in states $s>s^*$. Note that no allocation of decision rights can achieve this with spot interactions: both firms get positive net benefits from doing marketing their own way. However, a relational contract could achieve first-best adaptation, if either party agreed to do what the other party preferred in certain states.

The question now becomes to which party should the decision right be allocated in order to facilitate a self-enforcing relational contract? The relational contracts would differ depending on which party held the decision right. If the pharma company held the decision

**Figure 1: Pharma and Biotech disagreement**

First-best decisions are those that maximize the sum of the net benefits to the two parties. In this example, the first-best decision rule would be to do marketing biotech’s way in all states $s<s^*$, and do it pharma’s way in states $s>s^*$. Note that no allocation of decision rights can achieve this with spot interactions: both firms get positive net benefits from doing marketing their own way. However, a relational contract could achieve first-best adaptation, if either party agreed to do what the other party preferred in certain states.

The question now becomes to which party should the decision right be allocated in order to facilitate a self-enforcing relational contract? The relational contracts would differ depending on which party held the decision right. If the pharma company held the decision
right, it would promise to market the drug in ways that maximize biotech’s learning any time 
s was below s*. If the biotech held the decision right, it would make marketing decisions in the 
way preferred by the pharma company when s was above s*. In this example there is a 
clear answer to which relational contract yields lower maximum reneging temptation, and 
thus is more likely to be a self-enforcing equilibrium. If the decision right is allocated to the 
biotech firm, then it’s maximum reneging temptation occurs at state s⁺, where it would like 
to do marketing its way and it would cost it $N_B(s⁺)$ to acquiesce to doing it pharma’s way. 
However, if the pharma company held the decision right, it would face a lower maximum 
reneging temptation. Note that the pharma company is only tempted to renege when s is 
below s*, and its maximum reneging temptation occurs at s*. Since its maximum reneging 
temptation is less than $N_B(s⁺)$, the relational contract that has the pharma company 
controlling the decision right is feasible for higher discount rates than a relational contract 
that has the biotech firm controlling the decision right.

This example was chosen to demonstrate that even though the optimal allocation in 
spot transactions would be to give the decision right to the biotech firm, the optimal 
allocation under a relational contract gives the decision right to the pharma firm. The 
intuition highlights the key difference between spot and relational governance: even though it is on average more efficient to give the decision right to the biotech firm, the maximum reneging temptation is lower for the pharma firm, and so it should get the decision when actions can be regulated by a relational contract.

This example demonstrates Klein’s claim that formal contract terms facilitate relational 
contracts. In the quote on p. 4 above, Klein makes five points: (1) transactors are not indifferent regarding the contract terms they choose to govern their self-enforcing relationships; (2) the fundamental economic motivation for the use of court-enforceable contract terms is to supplement self-enforcement; (3) court-enforced explicit contract terms are a necessary evil that are used by transactors solely because the transactors possess limited reputational capital; (4) it makes no sense to analyze the malincentive effects of contract
terms in isolation from self-enforcement; and (5) incomplete contract terms cannot be understood without recognizing that their role often is to control [the total reneging temptation] so that it remains below [the surplus created by the relationship]. All five of these points are demonstrated by the example above.

Our second example makes a slight change to the net benefits to the biotech firm. In this example learning is less valuable to the biotech firm so that, as the complexity of the marketing task increases, it becomes less valuable to the biotech to do marketing its way. Thus, although it is still true that both firms would like to do marketing their own way in all states of the world, they are aligned in feeling that it would be relatively more valuable to do marketing pharma’s way in more complex states.

The figure below shows the net benefits to the pharma company and the biotech firm with these payoffs. The firms are aligned in the sense that their net benefits from doing marketing the biotech’s way decrease with the complexity of the marketing task\(^3\), but since the biotech still gets more value from marketing for more complex tasks, its value decreases less quickly. First-best adaptation occurs if decision-making switches at \(s^*\): everywhere to the right of this, it is optimal to do marketing pharma’s way; to the left it is optimal to do marketing the biotech’s way.

\(^3\) The pharma’s net benefit from doing marketing its way increases, so its net benefit from doing marketing biotech’s way decreases.
Once again, a relational contract has the potential to achieve first-best adaptation. If the decision right is allocated to the biotech, it must agree to do marketing pharma’s way whenever \( s \) is above \( s^* \), while if the decision right is allocated to the pharma company, it must go against its short-run interests and do marketing the biotech’s way whenever \( s \) is below \( s^* \). The maximum reneging temptation for the biotech if it holds the decision right occurs at \( s^* \), and is equal to \( N_B(d_1,s^*) \). If the decision right is allocated to the pharma company, its maximum reneging temptation also occurs at \( s^* \), and is equal to \( N_P(d_1,s^*) \). Thus the reneging temptations are the same for both parties, and it does not matter which party holds the formal decision right if a first-best relational contract is feasible.

**Figure 2: Pharma and Biotech in alignment**
However, it is not true that the formal allocation of the decision right is irrelevant for the achievement of a second-best relational contract. If first-best adaptation is not possible (because discount rates are too high) there may still be a relational contact that does better than spot transacting. In order for it to do so, the second-best relational contract must reduce the maximum reneging temptation relative to the first best. In addition, this decision rule must generate enough surplus that the inequality in Equation 7 holds. In the example above, we can show that at any discount rate for which a second-best relational contract is possible, it will be more efficient for the pharma company to hold the formal decision right.

Consider the second-best relational contract when the biotech holds the formal decision right, shown in Figure 3 below. Since first-best adaptation is not possible, it must be that first-best surplus is too small to support the biotech’s reneging temptation, \( N_B(s^*) \). However, a relational contract that allows the biotech to do marketing its way up to \( s^B \) reduces the reneging temptation (relative to the first-best contract) slightly. Such a contract also reduces total surplus, of course. The amount of the surplus reduction is the shaded region to the right of \( s^* \), weighted by the probabilities associated with each of these states. (For simplicity of exposition, we assume a uniform distribution over \( s \).) If this surplus loss is less than the reduction in reneging temptation times the discount rate (see Equation 7) then this second-best relational contract is feasible.
Now consider the second-best relational contract that allocates the formal decision right to the pharma company, shown in Figure 4 below. In this relational contract, the pharma company would do marketing the biotech’s way between $s^*$ and $s^p$. The figure is drawn so that the shaded region to the left of $s^*$ in Figure 4 is the same size as the shaded region to the right of $s^*$ in Figure 3: i.e. the surplus loss relative to first best is the same for both second-best contracts. Since the net benefit line for the pharma company is steeper, the reduction in the reneging temptation (for the same surplus reduction) will be greater for the pharma company than it was for the biotech. Thus, the second-best relational contract when the

**Figure 3: Second best under Biotech control**

Now consider the second-best relational contract that allocates the formal decision right to the pharma company, shown in Figure 4 below. In this relational contract, the pharma company would do marketing the biotech’s way between $s^*$ and $s^p$. The figure is drawn so that the shaded region to the left of $s^*$ in Figure 4 is the same size as the shaded region to the right of $s^*$ in Figure 3: i.e. the surplus loss relative to first best is the same for both second-best contracts. Since the net benefit line for the pharma company is steeper, the reduction in the reneging temptation (for the same surplus reduction) will be greater for the pharma company than it was for the biotech. Thus, the second-best relational contract when the
pharma company holds the decision right involves a lower reneging temptation for a given surplus reduction than a relational contract in which the biotech firm holds the formal decision right. This implies that, if a second-best relational contract is feasible, giving the formal decision right to the pharma company will result in a more efficient outcome. Notice that in this case this is true even though the efficient spot contract gives the decision right to the biotech.
Both of these examples show how formal contract terms affect the feasibility of (more efficient) relational contracts. As Klein argues, it is often fruitless, or even misleading, to analyze formal contract terms as if their purpose was to regulate a spot transaction between the parties. Rather, the formal terms serve to facilitate relational contracts by allocating the formal decision right to the party who is less tempted to renege. We now proceed to show that the simple intuition developed in this section can be applied much more generally, to a model with many parties and many (alienable and inalienable) decision rights.
4. A Richer Model of Adaptation

We now proceed to show that the simple intuition developed in the previous section can be applied much more generally, to a model with an arbitrary number of (i) parties, (ii) alienable decision rights, and (iii) inalienable decision rights.

4A. A Richer Model of Decision Rights (and Their Role in Spot Adaptation)

We assume there are $I$ parties and $J$ alienable decision rights. Party $i \in I$ receives inalienable private benefit $\pi_i$ and controls inalienable decision rights $\delta_i \in \Delta_i$. We write $\delta = (\delta_1, \ldots, \delta_i)$ for the vector of inalienable decisions chosen from the set $\Delta = \prod_{i \in I} \Delta_i$. Alienable decision right $j \in J$ is denoted $d_j \in D_j$, and we write $d = (d_1, \ldots, d_i)$ for the vector of alienable decisions chosen from the set $D = \prod_{j \in J} D_j$. We continue to denote the state by $s$, drawn from the finite set $S$ according to the probability density $f(s)$. The private benefit to party $i$ is thus a function of the alienable decisions, the inalienable decisions, and the state: $\pi_i(d, \delta, s)$.

Let $(d^{FB}(s), \delta^{FB}(s))$ denote the first-best decisions in state $s$, given by

$$
(8) \quad (d^{FB}(s), \delta^{FB}(s)) = \arg \max_{d \in D, \delta \in \Delta} \sum_{i \in I} \pi_i(d, \delta, s),
$$

which produce the total payoff in state $s$ $V^{FB}(s) = \sum_{i \in I} \pi_i(d^{FB}(s), \delta^{FB}(s), s)$ and the expected total payoff $V^{FB} = \mathbb{E}_s[V^{FB}(s)]$.

We define a governance structure to be an assignment of alienable decision rights to parties. We assume that each feasible governance structure $g: J \rightarrow I$ assigns each alienable decision right $j \in J$ to exactly one party $i \in I$. That is, there is no joint control of any decision right and there is no decision right that is left uncontrolled.

Let $G$ denote the set of feasible governance structures. For governance structure $g \in G$, define $J(i, g) \subset J$ as the decision rights held by party $i$. Denote the decision space for party $i$ under governance structure $g$ by $D_{ig} = \Delta_i \times \prod_{j \in J(i, g)} D_j$. We write $d_{ig}$ as an element of $D_{ig}$.
Note that \( d_{ig} \) contains not only any alienable decision rights allocated to party \( i \) under governance structure \( g \) but also party \( i \)'s inalienable decision rights \( \delta_i \). We write \( d \equiv (d, \delta) \) for the full vector of alienable and inalienable decisions.

We assume that, for each governance structure \( g \), and for each state \( s \), there is a unique Nash equilibrium decision vector, \( d_g^{NE}(s) \equiv (d_g^{NE}(s), \delta_g^{NE}(s)) \). That is, for each party \( i \), \( d_{ig}^{NE}(s) \) solves:

\[
(9) \quad \max_{d_{ig} \in D_{ig}} \pi_i((d_{ig}, d_{ig}^{NE}(s)), s).
\]

The payoff to party \( i \) in a spot transaction under governance structure \( g \) in state \( s \) is then \( \pi_{ig}^{NE}(s) \equiv \pi_i(d_g^{NE}(s), s) \), and the expected payoff is \( V_{ig}^{NE} \equiv E_s [\pi_{ig}^{NE}(s)] \), so the expected total payoff under governance structure \( g \) is \( V_g^{NE} \equiv \sum_{i \in I} V_{ig}^{NE} \). The optimal governance structure for a spot transaction, denoted \( g^{SP} \), therefore solves

\[
(10) \quad \max_{g \in G} V_g^{NE}.
\]

Let the expected total payoff under \( g^{SP} \) be denoted by \( V^{SP} \) and the associated expected payoff to party \( i \) by \( V_i^{SP} \). We assume that no governance structure achieves the first-best decision vector in every state, so \( V^{SP} < V^{FB} \).

4B. Relational Adaptation

Because spot governance is not efficient, we again ask whether the parties can do better via relational governance. In particular, we again use relational contracts not just to improve upon spot governance within a single governance structure, but instead to ask which governance structure facilitates the best feasible relational contract.

In this section’s richer model, a relational contract can specify not only the decisions \( d_{RC}(\cdot) \equiv (d_{RC}(\cdot), \delta_{RC}(\cdot)) \) that the parties hope to see taken, but also various payments that may help induce the parties to take these decisions. These payments can be positive or negative.
(i.e., they can be paid to or paid by a given party) and can occur at three different times. First, the payments might be paid before the state or any decisions are observed; denote such payments by $t_{ig}$. Second, the payments might be paid after the state is observed but before the parties make their decisions; denote such payments by $\tau_{ig}(s)$. Third, the payments might be paid depending on whether decisions are appropriately tailored to the state; denote such payments by $T_{ig}(d, s)$. We adopt the convention that a positive value of $t_{ig}$, $\tau_{ig}(s)$, or $T_{ig}(d, s)$ is a payment to party $i$ and a negative value a payment from party $i$. Furthermore, we require that these payments balance: $\Sigma_{i \in I} t_{ig} = 0$, $\Sigma_{i \in I} \tau_{ig}(s) = 0$ for all $s$, and $\Sigma_{i \in I} T_{ig}(d, s) = 0$ for all $d$ and $s$. A relational contract then specifies the decisions and payments $\{d^{RC}(\cdot), t_{ig}, \tau_{ig}(\cdot), T_{ig}(\cdot, \cdot)\}$, subject to the balance constraints. Figure 1 illustrates the timing of these potential payments within each period, relative to when the state is observed and the decisions are taken.

We analyze trigger-strategy equilibria: if any party reneges (on a payment or a decision), all parties engage in optimal spot governance thereafter. Achieving optimal spot governance typically requires reallocating control of the alienable decision rights, which typically requires a net side-payment $P_{ig}$ to party $i$ (or from party $i$ if $P_{ig}$ is negative). To be concrete, one could imagine that these side-payments arise from the Nash bargaining solution. Instead, we impose only two weak constraints on these side-payments: balance (i.e., $\Sigma_{i \in I} P_{ig} = 0$) and individual rationality (i.e., $P_{ig} + \frac{1}{\tau} V^{SP}_{i} \geq \frac{1}{\tau} V^{NE}_{ig}$ for all $i$). Thus, after reneging, each party

<table>
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<th>Figure 1</th>
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<td><strong>Timing of Payments in a Relational Contract</strong></td>
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- **State $s$ observed**
  - Efficiency wage paid $t_{ig}$
  - Bribe paid $\tau_{ig}(s)$
  - Bonus paid $T_{ig}(d, s)$

- **Decision $d$ taken**
receives $P_{ig}$, control of the alienable decision rights is reallocated, and the expected total payoff is $V^{SP}$ per period thereafter, as defined by (10).\(^4\)

Given a governance structure $g$, there are many reneging constraints that must be satisfied if a relational contract is to be a repeated-game equilibrium: each Party $i$ must (a) be willing to pay (or receive) $t_{ig}$, (b) be willing to pay (or receive) $\tau_{ig}(s)$, (c) be willing to take decisions $d^{RC}_{ig}(s)$, and (d) be willing to pay (or receive) $T_{ig}(d, s)$. To simplify the formal statements of the reneging constraints (a) through (d), we introduce the following notation:

\[
\pi^{RC}_{i}(s) \equiv \pi_{i}(d^{RC}_{i}(s), s) \quad \text{Payoff to party } i \text{ (excluding transfers) from relational-contract decisions in state } s \text{ under governance structure } g
\]

\[
V^{RC}_{ig}(s) \equiv t_{ig} + \tau_{ig}(s) + T_{ig}(d^{RC}_{ig}(s), s) + \pi^{RC}_{i}(s) \quad \text{Payoff to party } i \text{ (including transfers) from relational-contract decisions in state } s \text{ under governance structure } g
\]

\[
V^{RC}_{ig} \equiv E_{s}[V^{RC}_{ig}(s)] \quad \text{Expected payoff to party } i \text{ (including transfers) from relational-contract decisions under governance structure } g
\]

\[
d^{BR}_{ig}(s) \equiv \arg\max_{d_{ig} \in D_{ig}} \pi_{i}((d_{ig}, d^{RC}_{-ig}(s)), s) \quad \text{Party } i \text{'s best response in state } s \text{ under governance structure } g \text{ to relational-contract decisions by all other parties}
\]

\[
\pi^{BR}_{ig}(s) \equiv \pi_{i}((d^{BR}_{ig}(s), d^{RC}_{-ig}(s)), s) \quad \text{Payoff to party } i \text{ (excluding transfers) from best response in state } s \text{ under governance structure } g \text{, when all other parties take relational-contract decisions}
\]

We also recall the notation $\pi^{NE}_{ig}(s)$ and $V^{NE}_{ig}$ associated with (9) in Section 4A.

Let $r$ denote the discount rate per period. Then, given the notation above, the reneging

\[^4\text{It may seem strange that we rule out reassignment of decision rights ex post (i.e., after the state is realized but before decisions are taken) and yet allow for changes of control after reneging, but there is no inconsistency here. Again, our assumption is that the opportunity to take appropriate decisions is fleeting, and transferring control of decision rights takes some time, so this is why decision rights cannot be reassigned ex post. In contrast, there is time after reneging (namely, the rest of the current period, before the next period begins) to reallocate control to achieve optimal spot governance in future periods.}\]
constraints (a) through (d) can be written as follows. Constraint (a), that party i be willing to pay (or accept) $t_{ig}$, becomes

\begin{equation}
(11) \quad (1 + \frac{1}{r})^{RC}_{ig} \geq V^{NE}_{ig} + P_{ig} + \frac{1}{r} V^{SP}_{i}
\end{equation}

for all i. The left-hand side of (11) is the expected present value of party i’s payoffs on the equilibrium path, where all parties honor the relational contract. The right-hand side is the expected present value from reneging on $t_{ig}$. If party i reneges on this payment, then the relational contract is broken, so no further payments will be made this period by any party, all parties will take Nash equilibrium decisions in this period (generating expected payoff $V^{NE}_{ig}$), control of alienable decision rights will be reallocated (with payment $P_{ig}$), and optimal spot governance will ensue forever after (generating expected present value $\frac{1}{r} V^{SP}_{i}$).

Constraint (b), that party i be willing to pay (or accept) $\tau_{ig}(s)$, becomes

\begin{equation}
(12) \quad [\tau_{ig}(s) + \pi^{RC}_{ig}(s) + T_{ig}(d^{RC}(s),s)] + \frac{1}{r} V^{RC}_{ig} \geq \pi^{NE}_{ig}(s) + P_{ig} + \frac{1}{r} V^{SP}_{i}
\end{equation}

for all i and s. There are two ways in which (12) differs from (11): first, $t_{ig}$ has already been paid, so it does not appear in this period’s payoffs (the terms in square brackets) on the left-hand side; second, the state s has already been realized, so this period’s payoffs are contingent on s, not expectations.

Constraint (c), that party i be willing to take its relational-contract decisions, $d^{RC}_{ig}(s)$,
becomes

\[(13) \quad \left[ \pi_{ig}^{RC}(s) + T_{ig}(d^{RC}(s), s) \right] + \frac{1}{r} V_{ig}^{RC} \geq \pi_{ig}^{BR}(s) + P_{ig} + \frac{1}{r} V_{i}^{SP}\]

for all i and s. The left-hand side of (13) is the same as (12) except that \(\tau_{ig}(s)\) is omitted, because it has already been paid. The right-hand side of (13) is the same as (12) except that \(\pi_{ig}^{BR}(s)\) replaces \(\pi_{ig}^{NE}(s)\), because now party i is deviating from \(d_{ig}^{RC}(s)\) to \(d_{ig}^{BR}(s)\), while the other parties choose \(d_{ig}^{RC}(s)\).

Finally, constraint (d), that Party i be willing to pay (or accept) its bonus, \(T_{ig}(d, s)\), becomes

\[(14) \quad T_{ig}(d^{RC}(s), s) + \frac{1}{r} V_{ig}^{RC} \geq P_{ig} + \frac{1}{r} V_{i}^{SP}\]

for all i and s. If a relational contract \((d^{RC}(\cdot), t_{ig}(\cdot), \tau_{ig}(\cdot), T_{ig}(\cdot))\) satisfies (11) through (14) then we say that the decision rule \(d^{RC}(\cdot)\) can be implemented under governance structure \(g\).

Summing each of (11) through (14) over \(i \in I\) (and recalling that all payments must balance across the parties and so \(\sum_{i \in I} V_{ig}^{RC} \equiv V_{g}^{RC} \equiv V^{RC}\)) yields the necessary conditions

\[ (11') \quad \left(1 + \frac{1}{r}\right) V_{ig}^{RC} \geq V_{g}^{NE} + \frac{1}{r} V^{SP}, \]

\[ (12') \quad \frac{1}{r} V^{RC} + \sum_{i} \pi_{ig}^{RC}(s) \geq \sum_{i} \pi_{ig}^{NE}(s) + \frac{1}{r} V^{SP} \text{ for all } s, \]

\[ (13') \quad \sum_{i} \pi_{ig}^{RC}(s) + \frac{1}{r} V^{RC} \geq \sum_{i} \pi_{ig}^{BR}(s) + \frac{1}{r} V^{SP} \text{ for all } s, \text{ and} \]

\[ (14') \quad \frac{1}{r} V^{RC} \geq \frac{1}{r} V^{SP}. \]

We can restrict attention to relational contracts satisfying \(V^{RC} > V^{SP}\), and we have \(V^{SP} \geq V_{g}^{NE}\) by (10), so (11') and (14') are trivially satisfied. Similarly, we can restrict attention to relational contracts satisfying \(\sum_{i} \pi_{ig}^{RC}(s) \geq \sum_{i} \pi_{ig}^{NE}(s)\), because a relational contract that failed this inequality could be improved by setting \(d_{ig}^{RC}(s) = d_{ig}^{NE}(s)\) for any state in which
\[
\sum_i \pi_{ig}^{RC}(s) < \sum_i \pi_{ig}^{NE}(s), \text{ so (12')} \text{ is also trivially satisfied. Therefore, (13') is the key to our analysis. In Appendix 2, we show that if (13') holds then there exist payments } \tau_{ig}(s), \text{ and } T_{ig}(d, s) \text{ that satisfy (11) through (14). That is, (13') is necessary and sufficient for a relational contract that improves upon spot governance to exist under governance structure } g. \]

Inequality (13') leads to an appealing result. Let \( R_{ig}(s | d^{RC}(\cdot)) \equiv \pi_{ig}^{BR}(s) - \pi_{ig}^{RC}(s) \) denote Party i’s reneging temptation under governance structure g in state s, and define \( R_g(d^{RC}(\cdot)) \equiv \max_s \sum_i R_{ig}(s | d^{RC}(\cdot)) \) as the maximum aggregate reneging temptation. Because (13’) must hold for all s, it must hold for the s that achieves the maximum aggregate reneging temptation, so

\[
(15) \quad R_g(d^{RC}(\cdot)) \leq \frac{1}{r} \left[ V^{RC}(d^{RC}(\cdot)) - V^{SP} \right]
\]

is necessary and sufficient for (13’). Because (13’) is necessary and sufficient for (11) through (14), we have the following generalization of the claim in Section 3A.

**Proposition 1:** The decision rule \( d^{RC}(\cdot) \) can be implemented under governance structure g if and only if (15) holds.

In other words, given a particular governance structure, a decision rule can be implemented via a relational contract if and only if its maximum aggregate reneging temptation is less than the present value of the surplus that the decision rule creates (relative to optimal spot governance).

As noted in Section 3A, our Proposition 1 parallels results in MacLeod and Malcomson (1989) and generalized by Levin (2003).
(1989) and Levin (2003). But those models allow just one governance structure, whereas we allow multiple governance structures and so ask two related questions. First, what governance structure best facilitates a given relational contract? And second, what governance structure facilitates the best feasible relational contract? To answer the first question, note that the righthand side of (15) – the present value of the surplus that the decision rule $d^{RC}()$ creates, relative to optimal spot governance – is independent of $g$. (This independence follows from our assumption that, if any party reneges, then all parties engage in optimal spot governance thereafter.) Therefore, the optimal governance structure for implementing the decision rule $d^{RC}()$ minimizes the lefthand side of (15), so that $d^{RC}()$ can be implemented for the highest value of $r$. Let $g^*(d^{RC}())$ solve

$$\min_g R_g(d^{RC}()) \tag{16}$$

We therefore have

**Proposition 2:** The optimal governance structure for implementing the decision rule $d^{RC}()$ solves (16).

But Proposition 2 answers only our first question: it determines the optimal governance structure for implementing a given decision rule, but it does not determine what decision rule should be implemented (and what governance structure should be used to implement that decision rule). In one case, however, Proposition 2 also answers our second question: if the first-best decision rule can be implemented, then the optimal governance structure is the one that implements the first-best at the highest value of $r$. Let $g^*(d^{FB}())$ solve

$$\min_g R_g(d^{FB}()) \tag{17}$$

From Proposition 2 we therefore have
Corollary 1: The optimal governance structure for implementing the first-best decision rule $d^{FB}()$ solves (17).

As in Section 3B, we interpret this result as formal support for Klein’s claim that, although “many business relationships are self-enforced, transactors are not indifferent regarding the contract terms they choose to govern their self-enforcing relationships. … Incomplete contract terms cannot be understood without recognizing that their role often is to control [the total reneging temptation] so that it remains below [the surplus created by the relationship].”

To conclude this section, we state a second corollary, this time of Proposition 1. Let $d^{SP}()$ be the Nash decision rule under the optimal spot governance structure given in (10). Then we have

**Corollary 2:** The decision rule $d^{SP}()$ cannot be implemented under any governance structure distinct from $g^{SP}$. The proof of this result is straightforward, but its interpretation is not, so we begin with the former. For the decision rule $d^{SP}()$, the righthand side of (15) is zero, but for any governance structure “distinct from” $g^{SP}$ (by which we mean any governance structure for which $d^{SP}()$ is not the Nash decision rule), the lefthand side of (15) is positive, so $d^{SP}()$ cannot be implemented, for any value of $r$.

This argument parallels our discussion of “Bringing the Market Inside the Firm?” in our 2001 paper, where we showed that implementing spot-market governance is not feasible under the governance structure of a firm. Our present paper has a richer set of feasible governance structures than our 2001 paper had, so Corollary 2 speaks to a wider range of
efforts to “fake it” \((i.e.,\) attempts to use relational contracting to achieve the benefits of one governance structure while living under another), some of which might be loosely phrased as “Bringing Hierarchy into the Alliance?” or “Bringing a Joint Venture into the Firm?” Stated abstractly, the idea common to both papers is that, if one uses empirical observation of behaviors under an alternative governance structure to create target behaviors under a given governance structure, and if those empirical observations reflect spot behavior under the alternative governance structure, then it will not be possible to implement those target behaviors under the current governance structure, because there will be positive reneging temptation (on the lefthand side of (15)) but no surplus (on the right). In sum, relational contracts should be used to implement innovative decision rules that create surplus, not to ape the observed decision-making of an alternative governance structure.

5. Discussion

5A. Literature Review

This paper emphasizes five points, many of which are consistent with other literatures. First, firms can and do create rich governance structures via contracts that move decision rights across fixed firm boundaries. In our view, such contracts are understudied, relative to the active literature on changing firms’ boundaries. We see such contracts as akin but not equivalent to the literature on “financial contracting,” in which an investor may acquire decision rights in exchange for funding an entrepreneur (as explored, for example, in theory by Aghion and Bolton (1992) and evidence by Kaplan and Strömberg (2003); see Hart (2001) for a survey). Both our focus and our approach differ from these financial-contracting models. The difference in focus is that we take all parties to be established firms (each having private benefits and deep pockets), rather than focusing on the case of an entrepreneur and an investor (where the former has private benefits and the latter deep pockets). The
difference in approach is that we assume that decisions are not contractible ex post, rather than assume that decisions are contractible ex post but may not be chosen efficiently because of capital constraints.

Second, we argue that rich governance structures often exist in settings where the parties do not make specific investments. Lafontaine and Masten (2002) make a related claim, arguing that the need to protect specific investments is not the chief determinant of efficient governance in settings such as equipment leasing, franchising, and the pricing of heterogeneous transactions (such as freight hauling). We sketch a complementary argument in Section 2B, where we consider recent evidence concerning contracts that move decision rights across fixed firm boundaries, and we ask how this evidence corresponds to both the assumptions and the predictions of GHM-style models. This evidence suggests that rich governance structures can exist both when parties do not make specific investments and where specific investments may exist but are not central determinants of the efficient governance structure.

Third, we stress that in settings where parties do not make specific investments, governance structures can still have important efficiency consequences if they affect adaptation as uncertainty is resolved. Of course, if decisions were contractible ex post (and there were no other transaction costs), then the Coase Theorem would imply that ex post decisions would be efficient and ex ante decision rights would be irrelevant. When decisions are not contractible ex post, however, the ex ante allocation of decision rights determines the efficiency of adaptation. In our study of strategic alliances (Baker, Gibbons, and Murphy, 2006), we were driven to the view that decisions often are not contractible ex post, because alliance professionals emphasized this issue to us. As one informant put it, with only a little hyperbole, “No contract on earth will force an unwilling partner to perform.” Aghion, Dewatripont, and Rey (2002), Aghion and Rey (2002), Bajari and Tadelis (2001), Hart and
Holmstrom (2002), and Hart and Moore (2004, 2006) impose related assumptions and, in some cases, also focus on how governance structures can affect adaptation.

Fourth, continuing the general theme of our co-authored work to date, we emphasize the ubiquity and importance of relational contracts (i.e., self-enforcing agreements that are too rooted in the parties’ particular circumstances to be enforced by a court, but that can be enforced by the parties’ concerns for their reputations). Outside of economics, this idea was emphasized by Macaulay (1963), Macneil (1978), Dore (1983), and others in the context of relationships between firms and by Barnard (1938), Selznick (1949), Blau (1955), and others in the context of relationships within firms. Inside economics, relational contracts between and within firms have been emphasized informally by Klein, Williamson, and others, and they been explored in formal models by Bull (1987), MacLeod and Malcomson (1989), Kreps (1990), Levin (2003), and others.

Finally, drawing more directly on our prior work, we again study the potentially important interactions between formal and informal aspects of organizational design. Specifically, in Baker, Gibbons, and Murphy (1994, 1999, 2001, 2002), we analyzed how different choices of formal (i.e., court-enforceable) contracts or asset ownership structures can affect the feasible set of informal (i.e., self-enforced) relational contracts. Other models of such interactions include Garvey (1995), Halonen (2002), Bragelien (2003), and Rayo (2003). These interactions between formal governance structures and informal relational contracts are the force behind our analyses of why and how the optimal governance structure in a relational setting differs from that in a spot setting. In particular, by modeling these interactions, we formally explore Klein’s claim about the role of contract terms in facilitating self-enforcement. More generally, our approach begins to formalize decades of rich informal theory on relational adaptation, such as the work by Klein (1996), Klein and Murphy (1988, 1997), and Williamson (1971, 1973, 1975, 1991).
5B. Future Work

Xx
Appendix 1

The timing of the model is as follows: (i) two parties negotiate over control of a decision right; (ii) the parties simultaneously choose actions, with party i choosing action \( a_i \in A_i \) at cost \( c_i(a_i) \); (iii) the parties observe both the actions \( (a_1, a_2) \) and the state of the world, \( s \in S \); (iv) the parties negotiate over which decision, \( d \in D \), the party with control should choose; (v) the parties receive their payoffs, \( U_i(a_1, a_2, s, d) \) for \( i = 1, 2 \) (where \( U_i \) is gross of any monetary transfers and action costs). The actions \( (a_1, a_2) \) and the payoffs \( (U_1, U_2) \) are non-contractible. The decision \( d \) is non-contractible in stage (ii) but becomes contractible in stage (iv) after the state is revealed in stage (iii).

The following analysis is extracted from Gibbons (2005). We work backwards, beginning with the negotiation in stage (iv). If the parties observe actions \( (a_1, a_2) \) and state \( s \) in stage (iii), then the (conditionally) efficient decision solves

\[
\text{(A1)} \quad \max_{d \in D} U_1(a_1, a_2, s, d) + U_2(a_1, a_2, s, d)
\]

denote the solution by \( d^*(a_1, a_2, s) \) and the resulting payoffs by \( U_i^*(a_1, a_2, s) = U_i(a_1, a_2, s, d^*(a_1, a_2, s)) \). But if party i controls the decision right then, absent negotiation in stage (iv), party i will choose the decision \( d_i(a_1, a_2, s) \) that solves

\[
\text{(A2)} \quad \max_{d \in D} U_i(a_1, a_2, s, d)
\]

resulting in the payoffs \( U_i^j(a_1, a_2, s) = U_i(a_1, a_2, s, d_i(a_1, a_2, s)) \). There will be an incentive for the parties to negotiate in stage (iv) provided that \( U_i^*(a_1, a_2, s) + U_2^*(a_1, a_2, s) > U_1^j(a_1, a_2, s) + U_2^j(a_1, a_2, s) \).

As a tractable model of negotiation in stage (iv) when party i has control, suppose that the parties agree to the Nash Bargaining Solution, with the payoffs \( (U_1^j(a_1, a_2, s), U_2^j(a_1, a_2, s)) \) as the threat point. That is, the parties choose \( d \) and \( p \) to solve
where $p$ is the negotiated payment from party 2 to party 1 for which party $i$ agrees to choose decision $d$. The first-order condition for $p$ yields

\[ p = \frac{1}{2} \left[ (U_2(a_1, a_2, s, d) - U_2^i(a_1, a_2, s, d)) - (U_1(a_1, a_2, s, d) - U_1^i(a_1, a_2, s, d)) \right] , \]

from which it follows that $d$ solves

\[ \max_{d \in D} \frac{1}{4} \left[ (U_1(a_1, a_2, s, d) - U_1^i(a_1, a_2, s, d)) + (U_2(a_1, a_2, s, d) - U_2^i(a_1, a_2, s, d)) \right] , \]

so $d = d^*(a_1, a_2, s)$. That is, the parties bargain to the efficient decision, conditional on the observed actions and state, regardless of which party controls the decision.

But control does matter, even if it does not affect decision-making in stage (iv), because the payoffs in stage (iv) depend on who has control. When party $i$ has control, party $j$’s net payoff (ignoring payments negotiated in stage (i)) is

\[ NP_j^i(a_1, a_2, s) = \frac{1}{2} (U_j^i(a_1, a_2, s) + U_k^i(a_1, a_2, s)) - \frac{1}{2} (U_j^i(a_1, a_2, s) - U_k^i(a_1, a_2, s)) - c_j(a_j) , \]

where $i, j, k \in \{1, 2\}$ and $j \neq k$. Note that the first term involves the efficient total surplus, $U_j^i(a_1, a_2, s) + U_k^i(a_1, a_2, s) \equiv ETS(a_1, a_2, s)$, whereas the second involves the threat-point differential, $U_j^i(a_1, a_2, s) - U_k^i(a_1, a_2, s) \equiv TPD_j(a_1, a_2, s)$. In terms of this new notation, (A6) says that in choosing an action in stage (ii), party $j$ has a half-strength incentive to maximize $ETS(a_1, a_2, s)$, but also a half-strength incentive to maximize $TPD_j(a_1, a_2, s)$. In particular, from the threat-points term, party $j$ has incentives not only to improve her threat point but also to worsening party $k$’s.

We can now analyze whether expected total surplus is higher if party 1 controls the decision or party 2. From this governance-choice perspective, the half-strength incentives to maximize the efficient total surplus are irrelevant: these incentives exist regardless of who
controls the decision, so the optimal governance structure is determined entirely by the threat-points term. In particular, we would like to find a governance structure such that the existing half-strength incentives from TPD$_j$(a$_1$, a$_2$, s) closely approximate the missing half-strength incentives to maximize ETS(a$_1$, a$_2$, s).

Formally, given the negotiated decision (d) and payment (p) in stage (iv), we can solve for the actions induced in stage (ii) and, hence, for the optimal ownership structure in stage (i). If party i controls the decision, then party j will choose the action a$_j^*$ that solves

\[
\max_{a_j \in A_j} E_j[NP_j(a_j^*, a_k^*, s)],
\]

producing the Nash equilibrium actions (a$_1^*$, a$_2^*$), so expected total surplus will be

\[
(TS) \quad TS_i^* \equiv E_j(U_j^*(a_1^*, a_2^*, s) + U_j^*(a_1^*, a_2^*, s)) - c_1(a_1^*) - c_2(a_2^*).
\]

Efficient negotiation in stage (i) will result in the governance structure that maximizes expected total surplus. In this simple setting, with only one decision right, determining efficient control of the decision is simply a comparison of TS$_1^*$ to TS$_2^*$.

To illustrate the subtle mechanism underlying the GHM model, we develop an example like Whinston’s (2003). For simplicity, we suppress the state (s), although variability in s will of course play a central role in our adaptation model developed and analyzed in Sections 3 and 4. Let the feasible set of decisions be $D = \{d^*, d_1, d_2\}$, where parameter restrictions ensure that $d^*$ is the efficient decision and $d_i$ is the decision that maximizes party i’s payoff. Let the payoffs be $U_i(a_1, a_2, d^*) = B_i a_1 + b_i a_j$, $U_i(a_1, a_2, d_i) = F_i a_1 + f_i a_j$, and $U_i(a_1, a_2, d_j) = G_i a_1 + g_i a_j$, where all the parameters $B_i$, $b_i$, $F_i$, $f_i$, $G_i$, and $g_i$ are non-negative, and let $A_i = [0, \infty)$ and $c_i(a_i) = \frac{1}{2} a_i^2$. Finally, to make $d_i$ the decision that maximizes party i’s payoff, assume that $F_i > \max\{B_i, G_i\}$ and $f_i > \max\{b_i, g_i\}$, and to make $d^*$ the efficient decision, assume that $B_i + b_j > \max\{F_i + g_j, G_i + f_j\}$. The first-best actions are then $a_i = B_i + b_j$. 
Given the negotiated decision (d) and payment (p) in stage (iv), we can now solve for the actions induced in stage (ii), as in (A7). If party i controls the decision, then the equilibrium actions are

\[ a_i^i = \frac{1}{2}(B_i + b_j) + \frac{1}{2}(F_i - g_j) \]  

and

\[ a_j^i = \frac{1}{2}(b_i + B_j) + \frac{1}{2}(G_j - f_i) \]

That is, each party has half-strength incentives for the first-best action \((B_i + b_j)\) and half-strength incentives to improve her own threat point relative to the other party’s \((F_i - g_j)\) for the party in control and \((G_j - f_i)\) for the other party). The important point here is that the equilibrium actions are determined as much by the threat-point effects (the \(F, f, G,\) and \(g\) coefficients) as by the social-surplus effects (the \(B\) and \(b\) coefficients). Total surplus when i controls the decision is then

\[ TS^i = \frac{3}{8}(B_i + b_j)^2 + \frac{1}{4}(B_i + b_j)(F_i - g_j) - \frac{1}{8}(F_i - g_j)^2 + \frac{3}{8}(B_j + b_i)^2 + \frac{1}{4}(B_j + b_i)(G_j - f_i) - \frac{1}{8}(G_j - f_i)^2, \]

as in (A8).

The optimal allocation of control is then determined by comparing \(TS^i\) to \(TS^j\). Under fairly stringent conditions, the optimal allocation of control is determined solely by the social-surplus effects (the \(B\) and \(b\) coefficients). For example, we have

Result 1: If \(F_i - g_j = F_j - g_i > G_i - f_j = G_j - f_i > 0\), then i controls the decision if and only if \(B_i + b_j > B_j + b_i\).

For other parameters, however, it can be optimal for j to control the decision even though the total return to i’s action is larger. For example, we have

CONTRACTING FOR CONTROL
**Result 2:** If \( G_i = G_j = g_i = g_j = 0 \) and \( f_i > f_j \), then it can be optimal for \( j \) to control the decision even if \( B_i + b_j > B_j + b_i \).

As Whinston emphasizes, even the rich information provided in a detailed case study may not determine whether something like Result 1 or something like Result 2 applies, because the optimal allocation of control is determined as much by the threat-point effects (the F, f, G, and g coefficients) as by the social-surplus effects (the B and b coefficients).
Appendix 2

In this Appendix we summarize three recent empirical papers that explore the allocation of decision rights across fixed firm boundaries: Lerner and Merges (1998), Elfenbein and Lerner (2003), and Arrunda, Garicano, and Vasquez (2001). We ask whether (1) the qualitative descriptions of the contracting environment fit the assumptions of the GHM models and (2) the quantitative analyses of who controls which decisions match the predictions made by these models. We conclude that neither the assumptions nor the predictions of GHM-style models are entirely satisfactory, and we take these findings to suggest that there is room for a new approach. Of course, our conclusions about this evidence do not preclude the possibility that other evidence from other settings might be fully consistent with both the assumptions and the predictions of the GHM approach.

The three papers all examine the contractual allocation of decision rights between firms.

- Lerner and Merges (LM) analyze the terms of 200 strategic alliances between biotechnology R&D firms and financing firms (generally pharmaceutical companies). They use Aghion and Tirole’s (1994) version of the GHM framework to attempt to explain the allocation of 25 decision rights that appear in between 10 and 190 of the alliances analyzed. LM argue that three sets of these decision rights are key to the management of the alliance: the control of the clinical trial, the control of manufacturing rights for the drug developed, and the control of marketing for the drug.

- Elfenbein and Lerner (EL) examine the allocation of decision rights in internet portal alliances, again appealing to theoretical hypotheses from Aghion-Tirole. They analyze 106 contracts between portals and other firms (content providers) to see how certain decision rights—such as restrictions on lines of business for one of the parties, approval of content, or determination of the “look and feel” of the website—are allocated.
Arruñada, Garicano, and Vazquez (AGV) study the contractual relationship between automobile dealers and manufacturers in Spain. They analyze the contracts of 23 networks of auto dealers and ask what determines the allocation of 33 specific decision rights, such as the right to set sales targets, the right to determine the layout of the showroom, the number of test-drive vehicles, the right to survey customers, and the right to audit dealer accounts.

In all of these papers, the contracts allocate decision rights across fixed firm boundaries. One of the papers (EL) also considers assets (e.g., who owns the servers in the internet portal alliances), but this aspect of the evidence is beyond the scope of this paper (and is analyzed in the EL paper as being independent of the contractual allocation of decision rights).

We begin by assessing whether the contracting environment described in these papers reflects the assumptions of the GHM models. We first ask whether there are non-contractible actions that importantly affect the value of the relationship. In all three papers, the authors argue that there are such non-contractible actions.

- For biotech alliances, LM argue that “the complexity and unpredictability of the research presents challenges in drafting an enforceable agreement that specifies the contributions of the R&D firm” (p. 126). In particular, LM argue that the importance (and non-contractibility) of these contributions by the R&D firm will be greater for early-stage than for late-stage drug development projects.

- For internet portal alliances, EL argue that “both parties’ effort decisions were likely to have an impact on the value of the alliances and that many of these effort decisions were noncontractible” (p. 360). EL cite examples such as ongoing efforts to upgrade

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Both Lerner-Merges and Elfenbein-Lerner refer to these actions as “effort,” whereas Grossman-Hart-Moore generally refer to them as “investments.” We use the more neutral term “actions” to describe these *ex ante* choices and to distinguish them from “decisions” that are taken are *ex post.*
and expand the sites, use of customer data to direct customers to certain sites, and decisions about how partner content was incorporated into the site.

- For auto dealer-manufacturer contracts, AGV argue that actions taken by both the dealer and the manufacturer are non-contractible but important to the value of the network. “First, it is impossible to write a comprehensive contract ex ante...[that specifies] the price and number of cars to be sold by each dealer in each year, as well as their sales and service effort. Second, enforcement of the terms of exchange so defined suffers from the fact that many performance variables are costly to observe by the parties and are difficult to verify by potential third-party enforcers” (p. 260). AGV go on to argue that manufacturers also take non-contractible decisions ex post, such as determining the level of publicity and setting sales targets for the dealers, that affect their own and the dealers’ revenues and costs.

In short, all of these papers stress the importance of non-contractible actions that affect the value of the relationship. But the GHM model requires more than the presence of important non-contractible actions: in addition, it must be that these ex ante actions could be influenced by the ex ante contractual allocation of ex post decision rights (i.e., in the elemental model in Section 2A, the allocation of control in stage (i) determines the negotiated allocation of surplus in stage (iv), which determines investment incentives in stage (ii)).

Many empirical papers (not just the three we describe here) spend more time describing important non-contractible actions and less time explaining why alternative contractual allocations of decision rights might induce more efficient choices of these non-contractible actions. A more detailed examination of these papers, and a more careful mapping of the environments they describe onto our simple model in Section 2A, shows that the relationship between the non-contractible actions and the allocated decision rights often does not conform to the assumptions of the GHM framework.

CONTRACTING FOR CONTROL
EL cite five actions (“the development of material for the site, the maintenance and hosting of the site, the provision of customer service, order fulfillment, and billing” (p. 362)) as examples of effort decisions (a,’s in stage ii) that might drive the contractual allocation of decision rights (d’s exercised in stage iv). As examples of such d’s, EL include the right to determine the look and feel of the site, as well as the right to approve content to be posted. But many of these non-contractible actions are chosen while, or even after, these decision rights are being exercised – contrary to the timing of the GHM model. One could invent models in which decision rights allocated by contract (d’s) are exercised while (or even before) non-contractible actions are chosen, but such a framework is not the basic mechanism at work in the GHM model, where ex ante the allocation of ex post decision rights influences the choice of ex ante actions.

AGV are even more clear that the forces affecting the allocation of decision rights in Spanish auto retailing do not reflect the GHM mechanism. They describe no ex ante investments that are important to the value of the manufacturer-dealer relationship, and thus do not suggest that the contractual allocation of decision rights is influencing such investments. Rather, they simply argue that the allocation of these ex post decision rights is determined by considerations of who will exercise these rights most valuably. This argument is very much in the spirit of the model we develop in Sections 3 and 4.

Having considered whether the contracting environments described by these three papers correspond to the assumptions of the GHM model, we turn next to the quantitative analyses reported in these papers, to see whether they support the GHM predictions about the optimal allocation of decision rights. As emphasized in Section 2A, the predictions of the GHM model depend on a subtle mechanism. In Appendix 1, we develop an example like Whinston’s (2003) to show that the efficient allocation of control depends not only on social-surplus effects but also on threat-point effects. Unfortunately, we are unable to discern any information from any of these three empirical papers about threat-point effects, so we will
follow the assumption (implicit in much of the literature) that the threat-point effects have no impact on the efficient allocation of control. In brief, we find that none of the three papers provides much support for the proposition that the ex ante allocation of ex post decision rights is importantly influenced by the remaining social-surplus effects (i.e., the desire to improve the ex ante choice of specific investments).

- LM perform what is probably the cleanest test of this theory. They argue that in early-stage biotech alliances (where there is little understanding of what the alliance will produce and where the difficulty of specifying the contribution of the R&D firm is the greatest), the returns to the R&D firm’s actions are larger. Therefore, these early-stage alliances should allocate more ex post control rights to the biotech firm, in order to strengthen that firm’s incentives for valuable R&D efforts. LM note, however, that such a finding might be confounded by the fact that many biotech firms engaging in early-stage research are more financially constrained, and thus might be unable to bargain for as many control rights with the more powerful pharmaceutical firm. In order to control for this potential confounding effect, they regress the number of control rights held by the biotech on a dummy variable indicating whether the alliance is “early stage” and a set of controls for the financial strength of the biotech. Importantly, LM find that, even controlling for financial strength, early-stage alliances tend to allocate more control rights to the pharmaceutical firm and fewer to the biotech. LM conclude that “the analysis does not provide much support for the claims that concerns about underinvestment drive the allocation of control rights” (p. 130).

- EL also find little support for the prediction that higher returns to ex ante effort drive the contractual allocation of ex post decision rights. They regress the allocation of 12 control rights (coded as 1 if the control provisions favored the portal, -1 if they favored the partner, and 0 if neutral) on various independent variables including the “relative effort required by” the portal on the set of five actions discussed above. The results
show no consistent pattern: six of the coefficients are positive, six are negative, and there is no pattern to their statistical significance.

- AGV’s results suggest that an entirely different mechanism may determine the allocation of decision rights in the contracts between the auto manufacturers and the dealers. They test the informal theory that it is the need to achieve efficient *ex post* adaptation that drives variation in the contractual allocation of decision rights across different dealership networks. They find that when dealers’ *ex post* actions can damage the network more, manufacturers are allocated more control and monitoring rights over dealer’s actions: “Manufacturers of higher-quality cars and those with larger networks are allocated…more discretion over the operation of their networks” (p. xx). Thus, AGV’s findings suggest that the ex post decision rights are not allocated to improve ex ante incentives to invest in the relationship, but rather to improve the ex post decision-making itself.

Our examination of these three empirical papers suggests that neither the assumptions nor the predictions of the GHM-style models are entirely satisfying. The spotty correspondence between the contracting environments described in these papers and the assumptions of the GHM framework suggests that there is room for a new conception of the issues at play here. Similarly, the modest empirical support that these empirical papers provide for the predictions of the GHM model (at least with respect to the allocation of decision rights across fixed firm boundaries) again suggests that there is room for a new approach. Of course, our conclusion from this evidence does not preclude the possibility that other evidence from other settings might be fully consistent with both the assumptions and the predictions of the GHM approach.
References


CONTRACTING FOR CONTROL


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