

An Overview of the Interaction between Formal and Relational Contracting

Kenneth S. Corts*
Rotman School of Management
University of Toronto

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Abstract

A growing theoretical and empirical literature explores the interaction between formal and relational contracting, asking in particular whether these modes of contracting are complements or substitutes. Both the theoretical and empirical literatures, which explore many different models and institutional settings, show that either kind of relationship can prevail, depending on the circumstances. This survey attempts to summarize and synthesize this work in order to provide an accessible overview to this complex literature.

1 Introduction

There exist vast literatures within organizational economics concerning both formal contracts and relational contracts. Each of these literatures ranges from the purest of theoretical explorations to the most applied of empirical studies, spanning an enormous range of methodologies, settings, and insights. More recently, work at the intersection of these literatures has explored how these two modes of contracting interact, and this literature in turn spans the same diverse methods and settings. This survey seeks to organize, synthesize, and summarize the highlights of this literature that explicitly addresses the interaction of formal and relational contracts, with the goal of providing an accessible entry point to this work for students and researchers who wish to delve deeper into particular aspects of it.

Formal contracting refers to agreements between parties that court-enforceable. In general in this literature, once an agreement (here, a written contract) has been agreed to by its parties, it is assumed that the parties abide by the contract because there exists sufficient enforcement by some third party generally thought of as “the courts”. Some papers within this literature endogenize enforcement and consider court costs, incentives for harmed parties to bring legal actions, and so on, but in any case the expectation of adherence to the contract (even if not absolute and unconditional) is premised on the power of courts to enforce these contracts. There is therefore much discussion in this literature of what actions and outcomes are “verifiable”, where this is understood almost universally to mean verifiable by the courts. Actions and outcomes that are verifiable in this sense are the raw ingredients with which formal contracts are made—court-enforceable contracts may meaningfully condition behavior and payoffs on actions and outcomes that are verifiable.

*105 St. George St., Toronto, Ontario M5S 3E6; kenneth.corts@rotman.utoronto.ca.

Relational contracting refers to agreement between parties that are self-enforcing. In general in this literature, once an agreement has been agreed to by its parties, it is assumed that the parties abide by the contract because the promise of continued profitable interaction with the counterparty provides sufficient incentive to do so. In this literature it is generally not essential to specify whether the agreement is captured in a formal written contract or not (it is sometimes called “informal contracting” for this reason) or even whether the agreement is explicitly articulated or not (it is sometimes called “implicit contracting” for this reason). Without any expectation of relying on a court to enforce the agreement, it is of little consequence, in the abstract at least, whether the contract is explicit and formal or implicit and informal. What *is* essential is that it is the value of the continued relationship that sustains adherence to the contract, and for this reason it is clearest to refer to this self-enforcing arrangement as relational contracting. Without the need to rely on a court for enforcement, in this type of contracting the third-party verifiability of actions and outcomes is not critical; rather, relational contracts can condition behavior and payoffs on actions and outcomes that are “observable” to the contracting parties. This power to expand the set of contracting variables to include “observable but nonverifiable” actions and outcomes is central to discussions of the power of relational contracting.

As will be clear to anyone familiar with contract and organizational economics, both of these modes of contracting can be and have been the subjective of intensive study. The research that this paper focuses on, however, is the research that explicitly considers the interaction between these modes of contracting. The first thought that occurs to many organizational economists when approaching this literature runs along the following lines. Because relational contracting can condition behavior and payoffs on a broader set of variables (all the verifiable ones *and* all the merely observable ones), and because we know from the folk theorem that very patient players can sustain efficient outcomes even when doing so requires behavior at odds with their short-run self-interest, relational contracts are likely to implement efficient contracting outcomes in many cases when formal contracts cannot. Moreover, they are likely to be strictly superior because they do not involve many of the contracting costs associated with writing, monitoring, and enforcing formal contracts. Thus, when relational contracts are feasible, they are likely to substitute for and replace formal contracting. In this view, formal and relational contracts are two alternative ways of organizing a contractual relationship, and either might be chosen in particular circumstances; roughly, formal contracts would be preferred if firms were not sufficiently patient or did not interact frequently enough to invoke folk theorem-like reasoning, and relational contracts would be preferred when feasible. In sum, they are substitutes.

This reasoning is fine as far as it goes, but the burgeoning literature that this paper addresses shows that the interplay between these contracts is much, much richer than this view. In fact, formal and relational contracts may coexist; they are not strictly alternative modes of contracting. In addition, they may be substitutes or complements. The next section explores some of the theoretical insights that shed light on when, why, and how relational and formal contracts can interact. This is followed by a very short discussion of some relevant theory papers. The paper then turns in the next section to a brief discussion of the empirical evidence.

2 A synthesizing theoretical model

I begin by developing a very simple repeated contracting model that can incorporate both formal and relational contracting. This is meant to be illustrative of the kinds of arguments made in the literature. It is neither built from first principles nor meant to be general. Malcomson’s (2013) chapter in the *Handbook of*

Organizational Economics provides in my view the best current survey of the literature on relational incentive contracts. His section 5 focuses in particular on the interplay between formal and relational contracts. He works with a more general synthesizing model and discusses many of the same ideas and (theory) papers that I discuss. I work with a very specific and parameterized model in order to derive concrete analytical results that make quite explicit the logic and intuition of these results. I recommend Malcomson's chapter as a next step on the way to reading the primary research in this field.¹

A typical model in this literature features two parties interacting each period, with that interaction repeating indefinitely in a relatively stable way from period to period. Parties discount payoffs from future periods. Some random state variable may be realized within the period, and prescribed actions may depend on such states. Actions are chosen. Outcomes determined by those actions are realized, including the costs and profits that accrue directly to each party. Additional actions may occur at the end of the period, such as making various transfer payments that were, as part of the relational contract or a formal contract, conditioned on either verifiable or observable-but-nonverifiable actions and outcomes that were realized during the period. Finally, each party to the relational contract determines whether to continue with the relational contract (entering the next period with a mutual expectation that the existing relational contracts remains in force) or to exit the relational contract and instead pursue some outside option. This outside option typically involves forgoing any relational contracting with the same or any other party and instead making do with the best available formal contract.

The central analytical task in analyzing such a model is assessing the incentive compatibility constraints of the parties to the relational contract. One must also worry about participation constraints (ie, neither party must prefer to take up the outside option straight away), but these are typically of secondary importance since they can often be solved through fixed transfers. The incentive compatibility constraint for each player simply requires that the future value of the relationship—ie, the expected discounted value of continued participation in the relational contract—is sufficient to make unattractive a short-run deviation in the current period. Importantly, when both relational and formal contracts are present, this short-run deviation maximizes the agent's profits subject to the constraints imposed by the formal contract. (In general, it is assumed that the formal contract will be adhered to because of severe penalties available to the court, though it is also possible to model in a more nuanced way breach penalties for violating the formal contract.) If this relationship holds for both players, the relational contract is self-enforcing and is a viable choice for the contracting parties.

Mathematically but still informally, this can be represented as follows. Let v_i^* represent the one-period expected payoff for agent i under the relational and formal contracts that constitute the candidate equilibrium. Let $v_i^{deviation|formal}$ be the one-period payoff achieved by player i when that player maximizes its current-period payoff subject to the constraint of the formal contract, assuming other player adheres to the posited relational and formal contracts. Let $v_i^{formal-only}$ denote the maximized value of the profit available to player i if it exits the relational contract, given the state of formal contracting technology. Let δ be the common discount factor and recall that a discounted future stream of payments x can be simplified as follows: $\sum_{i=1}^{\infty} \delta^i x = \frac{\delta}{1-\delta} x$. The self-enforcement or incentive compatibility constraint for each player i is:

¹Section 10.4 in Bolton and Dewatripont's excellent *Contract Theory* text (Bolton and Dewatripont, 2005) also provides a more careful presentation of a benchmark model of relational contracting, with more detail in particular on issues including the justification for restricting attention to stationary relational contracts and trigger strategies, how one can transform simple trigger strategy equilibria to make them renegotiation proof, and how the model can incorporate hidden information about agent types. However, it does not shed light on the interaction between formal and relational contracts. Their brief discussion of that subject simply points back to the Bernheim and Whinston (1998), Baker, Gibbons, and Murphy (1992), and Pearce and Stacchetti (1998) papers discussed alongside others in this paper.

$$v_i^* + \frac{\delta}{1-\delta}v_i^* \geq v_i^{deviation|formal} + \frac{\delta}{1-\delta}v_i^{formal-only}.$$

Simply put, adhering to the full contract in the short run and continuing to receive the gains from that relationship indefinitely must (weakly) exceed the discounted value of making one's best deviation from the relational contract subject to the formal contract and then exiting the relationship and making do with the best formal contract available. Or, rearranging, the one-period gain from renegeing on the relational contract (subject to the formal contract) must not exceed the value foregone by terminating the ongoing relationship:

$$v_i^{deviation|formal} - v_i^* \leq \frac{\delta}{1-\delta}[v_i^* - v_i^{formal-only}].$$

This simple portrayal of the basic underlying logic of self-enforcing agreements makes a number of points clear:

1. The relationship must have value beyond what is achieved through formal contracting in order to be self-sustaining; if $v_i^* = v_i^{formal-only}$ this constraint can never be satisfied if the relational contract requires *any* departure from what is dictated by short-run self-interest.
2. The relational contract is more likely to be self-enforcing the higher is δ , the more valuable is the relationship in the sense just described, and the more limited the possibilities for profitable deviations.
3. The interaction between formal and relational contracts generally operates through one of two channels: through the outside option that is governed solely by formal contracts (the value of $v_i^{formal-only}$) or through the constraints the formal contract places on the deviation possibilities (the value of $v_i^{deviation|formal}$). It is also possible in some cases that they interact through v_i^* itself, for example in the case of within-period renegotiation over contingencies that cannot be fully specified in either formal or relational contracts.

This last point is important and will prove immensely helpful in synthesizing the varied theoretical literature. It is useful always to ask, in understanding a paper in this literature, whether the interaction arises through effects on deviation profits, through effects on outside option payoffs, or through some other channel that is not explicit in this basic model.

The next section proceeds to develop a very simple explicit model of this type in order to more fully demonstrate the precise logic behind the most prominent mechanisms for interaction of formal and relational contracts in this literature.

2.1 A simple model

Consider a simple infinitely repeated principal-agent model in which a principal is the residual claimant on an unverifiable per-period payoff $\pi(e)$, the value of which is determined by the effort e chosen by the agent in each period. Both principal and agent are risk-neutral, have reservation utility normalized to 0, and discount future periods with discount factor δ . The agent chooses to exert high or low effort, $e \in \{L, H\}$, incurring cost $c(e)$. Low effort costs the agent 0 and yields the principal 0: $c(L) = 0$ and $\pi(L) = 0$. These values can be considered normalizations. What is important in the model is that high effort is the efficient effort choice: $\pi(H) - c(H) > 0$. To maintain the utmost simplicity in the model, I will assume a specific parameterization of these payoffs. Specifically, $c(H) = v$ and $\pi(H) = 3v$. As a result, the total surplus in the first-best (ie, with efficient effort choice) is $3v - v = 2v$.

The usual assumption in this literature is that ex ante bargaining yields an efficient contract in which surplus net of reservation utilities is divided equally between the parties. Because both parties have reservation utility of 0, here this assumption implies focusing on contracts that implement the efficient effort H and yield net surplus of v to both the principal and agent.

It should be immediately clear that with contractible effort, payoffs, and payments, a very simple static contract, which can be repeated in each period, satisfies these conditions. A contract that dictates a payment of $b = 2v$ from the principal to the agent (b is mnemonic for “bonus” because the payment is conditional on effort) in any period in which the agent chooses $e = H$ (or, equivalently, in which $\pi = 3v$) suffices both to induce efficient agent effort and to achieve equal surplus division, with surplus net of costs equal to v for each party. Thus, the agency problem here arises from the non-verifiability of both the action e and the principal’s payoff π , which corresponds to the agent’s effort deterministically and one-to-one.

While the focus is normally on the contractibility of the effort, note that in this simple model with a deterministic payoff to the principal, the principal’s gross payoff must also be noncontractible for effort to be noncontractible. If the principal’s payoff is contractible, the “sell-the-firm” solution becomes feasible. The noncontractibility of the principal’s payoff can be thought of deriving from the embeddedness of this interaction in a larger game. That is, the principal may represent a large and complex organization whose publicly verifiable payoffs are an aggregate for the entire organization, while the payoff deriving from this agent’s action is one small and unverifiable component of that larger payoff. I assume throughout that the principal’s gross payoff π is unverifiable and noncontractible, which simplifies discussions of contractibility by focusing on a payment conditional on effort level.

I also follow the literature in considering relational contracts of a simple trigger-strategy form, where a one-period agreement is repeated in each period, with the relationship being terminated immediately and forever if either firm deviates from that one-period agreement. When the relationship is terminated, the parties revert forever after to the most profitable feasible formal contract. The literature shows both that the restriction to this type of contract suffices to support all self-enforceable relational contracts and that the supported outcomes can be made renegotiation-proof by other forms of relational contracts that are more subtly conditioned on history (but do not expand the set of self-enforcing equilibria).

2.2 The basic relational contract

The first step in understanding the interaction of formal and relational contracting is to understand the how the basic relational contract works in this model, absent any formal contracting. In a way, this is the “theory 0” for the interaction of formal and relational contracting described in the introduction. This model has been structured so that the formal contract is useless, due to the noncontractibility of effort. Thus, if the relational contract can induce efficient effort, it suggests that relational contracts can substitute for formal contracts when formal contracts are ineffective. Here, relational contracting is an alternative, substitute, and sometimes superior way of governing the exchange. From that understanding, the analysis can proceed to explore more nuanced interactions in cases where formal and relational contracts may coexist.

Consider the relational contract that specifies that the agent will provide high effort; that the principal will pay a bonus of $2v$ upon observation of that high effort; and that the parties will revert to formal contracting (ie, no trade) once either parties deviates from this relational contract. The bonus is set at $2v$ because this is the sum of the agent’s effort cost and the agent’s half of the net surplus (consistent with ex ante bargaining between indispensable parties).

The agent’s incentive constraint requires that deviating and terminating the relationship is not preferred

to adhering to the relational contract. Deviating implies shirking on effort and therefore neither receiving the bonus payment this period nor incurring the effort cost, and then earning 0 profit in all future periods.

$$IC(A) : \quad 0 + \frac{\delta}{1-\delta}0 \leq (2v - v) + \frac{\delta}{1-\delta}v$$

This obviously holds, as the left-hand side is 0, reflecting the fact that, considering that the bonus payment is conditional on high effort which is immediately observable, the agent does not have even a short-run potential gain from deviation.

The principal’s incentive constraint requires that refusing to pay the bonus payment (but still reaping the rewards of the agent’s high effort), then terminating the relationship, is not preferable to adhering to the relational contract.

$$IC(P) : \quad 3v + \frac{\delta}{1-\delta}0 \leq (3v - 2v) + \frac{\delta}{1-\delta}v$$

Unlike the agent, the principal *does* have a short-run incentive to deviate, since the principal can retain the full bonus payment without losing the benefits of the agent’s effort. Thus, self-enforceability of this relational contract does rely on the principal sufficiently valuing the ongoing relationship. Rearranging, the principal’s incentive constraint holds for large enough discount factors, specifically for $\delta \geq \frac{2}{3}$. This is the basic analysis of a relational contract, which can be summed up in the following proposition.

Proposition 1 *Assume that effort is observable but not verifiable. Then for a sufficiently high discount factor ($\delta \geq \frac{2}{3}$), relational contracting can implement efficient effort while formal contracting cannot.*

2.3 Effects through outside option payoffs

Assume in this subsection that the agent’s chosen effort is normally, as before, observable but unverifiable. That is, it could be subject of a relational contract but not of a formal contract. However, by making investments in contracts, monitoring, and enforcement at the beginning of each period, the principal and agent can create a situation in which effort *is* contractible in that period. Assume both principal and agent must incur costs of m , so that the costs of creating a regime of enforceability total $2m$, where $m \in [0, v]$. Think of m as mnemonic for “monitoring costs”. The monitoring costs considered are capped at v because this is the level beyond which investing in these costs would never be attractive; beyond this level, the joint monitoring costs completely offset the joint surplus created by efficient investment.

The possibility of investment to create contractible effort alters the model by changing the payoff to deviating from the relational contract. Recall that deviation from the relational contract by either party results in reversion to the best formal contract. Absent the investment in monitoring, the best formal contract in this model yields per-period payoffs of 0. But with the investment in monitoring, the efficient effort is implemented, albeit with the parties the monitoring costs, and equal division of the net surplus implies payoffs to both parties of $v - m$.

If a relational contract can support efficient effort, it avoids this cost associated with formal contracts and yields both parties the maximum possible surplus v . A relational contract here, given the limited set of observables, takes the same form as described above for the benchmark relational contracting analysis: “the principal will pay the agent $b = 2v$ at the end of the period if the agent has chosen effort H ”. Now, the relational contract is self-enforcing if the following incentive constraints, which differ from those above only

in their assumption about the continuation profits after deviation, are satisfied:

$$IC(A) : \quad 0 + \frac{\delta}{1-\delta}(v - m) \leq (2v - v) + \frac{\delta}{1-\delta}v$$

$$IC(P) : \quad 3v + \frac{\delta}{1-\delta}(v - m) \leq (3v - 2v) + \frac{\delta}{1-\delta}v$$

As before, it is easy to see that $IC(A)$ always holds, because the agent does not have even a short-run temptation to deviate from the relational contract. Shirking saves the agent effort cost v but also forfeits the bonus payment $2v$ prescribed by the relational contract. Whether $IC(P)$ holds, in contrast, depends on the particular values of the parameters. Rearranging $IC(P)$ yields the threshold discount factor above which the relational contract is self-enforcing:

$$IC(P) \text{ holds for } \delta \geq \widehat{\delta}(m) = \frac{2v}{2v + m}.$$

First, note that $\widehat{\delta}(v) = \frac{2}{3}$; that is, this analysis reduces to that of the prior subsection when the cost of creating verifiable effort is so high that it fully offsets the gains from doing so. Second, note that $\widehat{\delta}(m) < 1$ for all $m < v$; thus, this efficient relational contract is self-enforcing for high enough discount factors when the monitoring cost is low enough that some strictly positive surplus is left on the table. Note also that $\widehat{\delta}(m)$ is decreasing in m . It is less difficult to sustain relational contracts and induce efficient effort (ie, a lower discount factor is required) as m increases, and more difficult to sustain relational contracting as m falls. Recall that m represents the cost of using formal contracts; thus, one can say in this model that “the formal contracting environment improves” when m falls. Here, a better formal contracting environment means a higher payoff in the future after a relational contract breaks down. This makes relational contracting more difficult to sustain, requiring higher discount factors for self-enforceability. This relationship can be seen in the following figure.

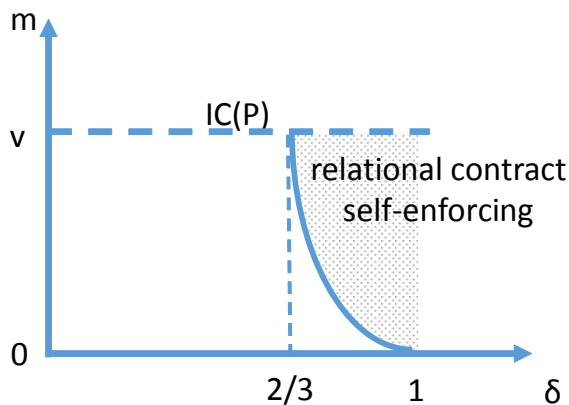


Figure 1

Combined with the fact that the value v of the relational contract to each party is strictly superior to the value $v - m$ of the formal contract to each party, these observations yield the following result on the interaction of formal and relational contracts. This proposition describes, using comparative statics in the discount factor δ , a relationship of substitution between relational and formal contracts

Proposition 2 *If the relational contract implementing efficient effort is self-enforcing ($\delta \geq \widehat{\delta}(m)$), it will be chosen by the contracting parties rather than a formal contract. Given m , as δ increases and surpasses $\widehat{\delta}(m)$ the relational contract substitutes for and replaces the formal contract.*

It is straightforward to calculate the threshold monitoring cost above which relational contracts will be self-sustaining, as a function the discount factor: $\widehat{m}(\delta) = 2v \frac{1-\delta}{\delta}$. Comparative statics in the strength of the formal contracting environment, captured in m , allow the characterization of a different kind of relationship of substitution between relational and formal contracting.

Proposition 3 *If the relational contract implementing efficient effort is self-enforcing ($m \geq \widehat{m}(\delta)$), it will be chosen by the contracting parties rather than a formal contract. Given δ , as the formal contracting environment becomes stronger (m decreases and falls below $\widehat{m}(\delta)$) the strength of formal contracts undermines the feasibility of relational contracting; formal contracting substitutes for and replaces relational contracting.*

These results demonstrate how, in the context of this very simple model, formal and relational contracting can be substitutes as the contracting environment changes in various ways. In particular, the strength of formal contracting can change the prospects for post-relational contracting and thereby affect the self-enforceability of relational contracts.

2.4 Effects through limiting deviation profits

For this and subsequent subsections, I return to the assumption that effort is never observable (equivalently, that m as defined in the prior model is prohibitively high). However, formal contracts that specify an unconditional surplus transfer are possible. That is, the fact that a payment is made by the principal to the agent is verifiable, and therefore contractible, but it must be a fixed “wage” w that is not conditional on e or π because these other elements of the model are assumed to be unverifiable.

It should be immediately transparent that a purely formal contract will be of no value in this model. Unconditional payments cannot induce the agent to undertake a costly action in a one-shot game. Thus, no surplus can be generated by a purely formal contract. The focus in this section is not, as in the prior section, the possible substitution between a pure relational contract and a pure formal contract. Rather, it is the use of formal contracts embedded in a self-enforcing relational contract. A formal contract can be used to limit the deviation profits within the context of a relational contract, altering the incentive constraints that determine self-enforceability.

Specifically, I focus on a relational contract that, as in the prior section, both implements the efficient action and achieves the usual symmetric ex ante division of surplus. It suffices to examine a relational contract (with an embedded formal wage contract) of the following form. A formal contract commits the principal to pay a fixed and unconditional wage w to the agent. The relational contract commits the agent to choosing high effort and the principal to paying, in addition to the wage, a bonus b upon observation of a choice of high effort by the agent. Any deviation from this relational contract results in a termination of the relational contract and a reversion to the best formal contract, which yields no surplus to either party. Note that achieving the desired surplus division arrived at in ex ante bargaining requires $w + b = 2v$.

For this relational contract to be self-enforcing, we must check the incentive constraint of the agent (which ensures choice of efficient effort) and the incentive constraint of the principal (which ensures that the principal does not renege on the promised bonus):

$$IC(A) : \quad w + \frac{\delta}{1-\delta}(0) \leq w + b - v + \frac{\delta}{1-\delta}(w + b - v)$$

$$IC(P) : \quad 3v - w + \frac{\delta}{1-\delta}(0) \leq [3v - (w + b)] + \frac{\delta}{1-\delta}[3v - (w + b)].$$

Both principal and agent must prefer the ongoing value of the relationship to the best one-period deviation profit followed by reversion to the zero-surplus formal contract. For the agent, the best deviation is to choose low effort, saving the effort cost but earning only the wage and not the bonus. For the principal, the best deviation is to renege on the bonus payment, earning gross surplus of $3v$ and paying the agent only the formally contracted wage w .

Substituting out $w = 2v - b$ to achieve the desired surplus division and rearranging, the incentive constraints can be simplified:

$$IC(A) : \quad b \geq \frac{1-2\delta}{1-\delta}v$$

$$IC(P) : \quad b \leq \frac{\delta}{1-\delta}v.$$

Note that the bonus b must be sufficiently *large* in order to satisfy the agent's IC (if it is too small, the agent will not choose to exert costly effort), while it must be sufficiently *small* to satisfy the principal's IC (if it is too big, the principal will choose not to pay it). Comparing the right-hand sides of these expressions, it is clear that there exists a bonus b satisfying both constraints, and therefore yielding a self-enforcing efficient relational contract, if and only if $\delta \geq \frac{1}{3}$. These constraints and their implications for the interaction of formal and relational contracts in this model are most easily seen by graphing b against δ .

The natural range of b, w combinations to consider in such a relational contract, recalling that surplus division requires $b + w = 2v$, is the range of non-negative b and w . That is, it is natural to focus on the range in which the bonus b varies from 0 to $2v$ (and the corresponding wage $w = 2v - b$ varies from $2v$ to 0). The figure below focuses on this range.²

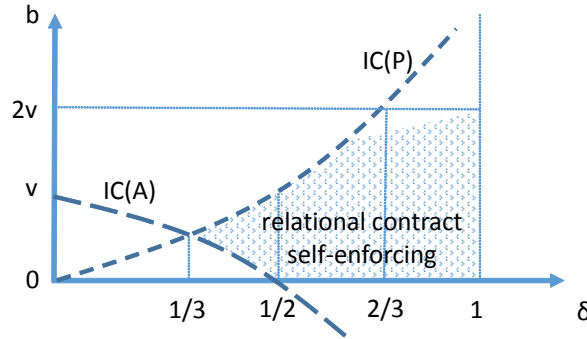


Figure 2

Note that IC(P) is satisfied *below* the constraint depicted in the figure (the bonus must be small enough that the principal does not renege on the promise to pay it), while the IC(A) is satisfied *above* the constraint depicted (the bonus must be big enough to induce efficient effort). It is straightforward to calculate the critical values of δ labelled in the figure, which demarcate the relevant regimes. When $\delta < \frac{1}{3}$, no efficient relational contract is self-enforcing; the players are too impatient. When $\frac{1}{3} < \delta < \frac{1}{2}$, the efficient relational contract is self-enforcing, but only for specific values of b such that $0 < b < 2v$; that is, self-enforceability

²Note that there is no theoretical reason to restrict attention to this range. When δ is very high and the promise of future contracting is therefore large, a relational contract with in-period *punishments* for efficient effort (ie, negative bonuses $b < 0$) can be self-enforcing because the promise of future contracting with high wages ($w > 2v$) is sufficient to ensure efficient effort despite these punishments. There is no obvious gain to considering this larger range of values for b, w .

requires a *strict mixture* of formally contracted wages and relationally contracted bonuses. When $\frac{1}{2} < \delta < \frac{2}{3}$, the efficient relational contract is self-enforcing, both for a variety of strict mixtures of wage and bonus, but also for all-wage contracts ($b = 0$ and $w = 2v$). When $\delta > \frac{2}{3}$, the efficient relational contract is self-enforcing for any combination of b and w , including both wage-only and bonus-only contracts.

This model, which derives an interaction between formal and relational contracts through the “deviation payoffs” channel, illustrates the second main theme in the literature. The following propositions characterize the senses in which relational and formal contracts can be either substitutes or complements in this model.

Proposition 4 *For intermediate discount factors ($\frac{1}{3} < \delta < \frac{2}{3}$), neither a purely formal contract ($b = 0$; no conditioning of future periods on current period) nor a purely relational contract ($w = 0$) can implement efficient effort. However, a relational contract that includes formal contracts ($w > 0$) can do so. In this sense, formal and relational contracts are complements.*

This is the most important common argument in the literature for a “complements” relationship: formal contracts constrain deviation opportunities and take some pressure off the incentive constraints, yielding self-enforceability where it is not achieved with relational contracting alone. Here, formal and relational contracts together achieve efficiency when neither type of contract alone can do so. A second proposition is less central to the argument, but is worth making as a complement to the earlier discussion of substitutability of formal and relational contracts.

Proposition 5 *For high discount factors ($\delta > \frac{2}{3}$), a purely formal contract does not generate any surplus, while a relational contract can implement efficient effort and achieve maximal surplus. This can be achieved, within such a relational contract, by allocating the aggregate payment to the agent in any proportion between formally and relationally ensured payments. In this sense, always within the context of a broader relational contract, formal and relational payment promises (ie, wages and bonuses) are substitutes.*

One further insight is worth extracting from this model. Note that attaining self-enforceability with a wage-only payment scheme (when $\frac{1}{2} < \delta < \frac{2}{3}$) does not mean that the relational contract is not needed. The relational contract’s promise of future contracting continues to be what ensures the agent’s exertion of costly effort. Indeed, in this case, one can think of the formal and relational contract as working together to solve different incentive problems; the ($w = 2v$) formal contract ensures that the principal’s incentive problem with respect to payment is satisfied, while the relational contract ensures that the agent’s problem with respect to effort is satisfied. Indeed, in discussing the literature in subsequent sections it will become clear that it is sometimes useful to think about the different types of contracts as solving different types of incentive problems to complete an agreement that induces the desired outcomes. This is seldom a clear-cut as it is in this model, but the idea remains a useful one.

2.5 Effects through imperfect verifiable performance measures

The prior subsection’s example involving the use of a formal contract to specify an unconditional wage payment serves an important purpose in showing how formal contracts can complement relational contracts by taking some pressure off of incentive constraints. However, it is somewhat unsatisfying because it employs such a simple formal contract—a completely unconditional contract. The literature more generally, both theoretically and empirically, illustrates that this general principle applies equally to more robust formal contracts. In particular, it is important to understand that the same logic applies when the agent’s effort,

for example, is partially or imperfectly verifiable. This argument arises repeatedly in the literature, and it is important to grasp it firmly.

Just as a formal contract ensuring a guaranteed *unconditional* payment can relax an incentive constraint (in particular, the incentive constraint ensuring that the principal follows through on promised payments), a formal contract specifying a *conditional* payment can also relax an incentive constraint (in fact, most often, that very same incentive constraint of the principal). This is true even when the conditional payment specified in the formal contract is conditioned on verifiable information that is imperfectly or only partially related to the information that would be used in a first-best contract in a fully verifiable world. In essence, this argument is that some verifiability is better than none, and that it may be easier to sustain a relational contract on the “residual agency problem” after formal contracting has been taken as far as it can go. This subsection slightly enriches the model of the prior subsection in order to make this point quite concrete.

Continue with the model of the prior subsection, but now assume that the agent’s effort is split into two totally independent components. The difference is that one component of the effort is verifiable, while the other remains observable but unverifiable as in the prior subsection. The agent must choose both e_1 (verifiable) and e_2 (observable but unverifiable), each of which can be H or L . As before $c(e_L) = 0$, and now $c(e_H) = v/2$. Importantly, tasks are assumed to be strictly complementary in production; that is, high effort on *both* tasks is required to generate gross surplus, accruing to the principal, of $2v$. High effort on only one of the tasks is assumed to generate no gross surplus. The costs of the agent’s effort have been divided equally between the two components, leaving all the aggregate quantities unchanged. It remains true that efficiency requires high effort, now on both tasks, and that ex ante bargaining implies a net surplus of v for each player.

The components of the principal’s payment to the agent now include the unconditional wage payment w and two bonus payments b_1 and b_2 each conditioned on the corresponding effort level. Of these, w and b_1 are enforceable in a formal contract, while only a relational contract can condition b_2 on e_2 . The sum of the payment is constrained by the ex ante bargaining assumption, as in the prior subsection, so that $w + b_1 + b_2 = 2v$.

Note that it remains true that formal contracts alone cannot implement efficient effort or achieve maximal surplus. The formal contract cannot include any payment that is conditional on e_2 , and therefore the agent cannot be induced to exert the costly effort required to choose $e_2 = H$. This model is, in essence, the simplest possible model of a multi-task problem. Efficiency requires that the agent exert effort on two tasks, but because effort on one of the tasks is more readily verified than effort on the other, feasible incentive schemes using formal contracts induce inefficient allocation of effort across tasks. In this simplest case, one task is perfectly verifiable, and the other has no verifiable signal at all. As a result, the best formal contract induces efficient effort on one task and no effort at all on the other. The link between this model and multi-task models will be important to keep in mind in the discussion of the theoretical literature later.

Because no formal contract can induce costly unverifiable effort e_2 , efficiency will require a relational contract. The question is whether using this imperfect or incomplete indicator of agent effort can improve the outcome—in particular, whether doing so makes the relational contract self-enforcing over a larger range of discount factors. As before, the candidate relational contract will specify high effort for the agent and an appropriate payment plan for the principal, with the relationship terminating forever after immediately upon any deviation from this plan by either party.³

³Note that it is important that the contractibility of e_1 has no bearing on the total surplus that can be generated under the formal contract alone. If it did, this could potentially undermine relational contracting by raising the value of the outside option. The assumption of strict complements for efforts is therefore important to ruling out this effect and focusing on the

Consider the agent's incentive constraints. The agent can now choose to shirk on both effort levels or only one of the two. It is immediate that shirking on only e_1 is inferior to shirking on both: shirking on both efforts leads the agent to receive only the fixed wage w and incur *no* effort costs, while shirking on only e_1 leads the agent to receive only the fixed wage w while incurring *positive* effort costs.

A bit of algebra demonstrates that the incentive constraints for shirking on both efforts and for shirking on only e_2 are equivalent if $b_1 = v/2$ (that is, the formally contracted incentive compensation conditional on $e_1 = H$ is just sufficient to offset effort costs on e_1). I will make this assumption, which does limit the relationally enforced bonus b_2 , in the interest of simplicity of exposition. In this model, it is easy to show that this assumption does not limit the range of discount factors for which the relational contract is self-enforcing.

The relevant incentive constraint for the agent is:

$$IC(A) : \quad w + \frac{\delta}{1-\delta}(0) \leq w + b_1 + b_2 - v + \frac{\delta}{1-\delta}(w + b_1 + b_2 - v).$$

Substituting for w based on the expression specifying total transfers ($w + b_1 + b_2 = 2v$, or $w = 2v - b_1 - b_2$) and using $b_1 = \frac{v}{2}$, this becomes:

$$IC(A) : \quad b_2 \geq \frac{1-3\delta}{2(1-\delta)}v.$$

The incentive constraint for the principal, which ensures that the principal does not renege on the conditional payment b_2 specified by the relational contract only, is:

$$IC(P) : \quad 3v - w - b_1 + \frac{\delta}{1-\delta}(0) \leq [3v - (w + b_1 + b_2)] + \frac{\delta}{1-\delta}[3v - (w + b_1 + b_2)].$$

Again substituting for w and b_1 , this becomes:

$$IC(P) : \quad b_2 \leq \frac{\delta}{1-\delta}v.$$

Combining these inequalities, one can show that both are satisfied for some appropriate b_2 as long as $\delta \geq \frac{1}{5}$. Note that this is smaller than the discount factor threshold in the prior subsection: conditioning the formally contracted payments on the imperfect, incomplete information on agent effort improved the self-enforceability of the relational contract. This yields the main result of this subsection.

Proposition 6 *In this model, using a formal contract to specify payments to the agent conditional on incomplete indicators of agent effort expands the range of discount factors for which there exists a self-enforcing relational contract implementing efficient effort. In this sense, formal and relational contracts are complements.*

To see the results of this model in the context of the figure from the prior subsection, one must add together the two components of the conditional payments—that is, both the formally contractible b_1 and the relationally contractible b_2 —to arrive at an aggregate bonus payment. Doing so and then plotting in δ, b space as before yields the comparisons evident in the following figure.

effect through the principal's incentive constraint.

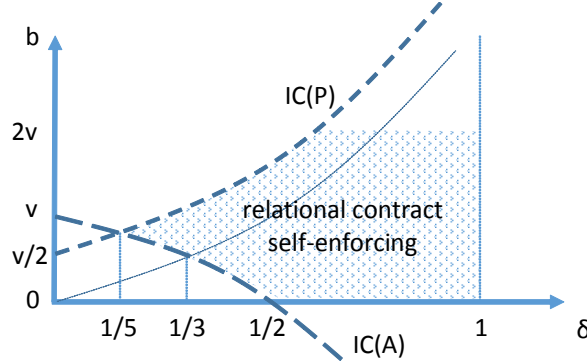


Figure 3

The intuition for this effect should be quite clear. The agent’s incentive constraints are not affected by the ability to shift some of the bonus into a form that is enforceable through a formal contract. The agent’s tasks are cut in half, with twice as many tasks at half the productivity and half the costs. It remains best to shirk all effort if one is going to deviate, but the promised continuation payoff is the same as before, and the same aggregate bonus therefore suffices to ensure efficient effort at a given discount factor. The $IC(A)$ line does not move in the figure. What changes instead is the principal’s incentive constraint $IC(P)$. Because the formal contract specifies a portion of the contingent payment to the agent, the part that the principal must be induced not to renege on is smaller. This slackens the $IC(P)$ constraint at any discount factor, allowing larger *aggregate* bonuses (precisely because the relationally enforced component is smaller) to be sustained in the relational contract. In the figure, $IC(P)$ shifts up, moving its intersection with $IC(A)$ to the left and expanding the set of discount factors for which an efficient relational contract is self-enforcing.

2.6 Effects through on-path profits: adaptability and renegotiation

Relational contracts may also interact with formal contracts by governing the relationship between parties who do have formal contracts when noncontracted contingencies arise on the equilibrium path—that is, noncontracted contingencies arise *other than* as a result of a deviation from a relational contract. One can think of this in several ways: the relational contract may govern adaptation to circumstances as additional information arises (that was not anticipated or specified in the formal contract), the relational contract may govern how the formal contract is renegotiated in light of such new information, or the relational contract may serve to determine the consequences or out-of-court resolution of a breach of the formal contract (such a breach being, in essence, its own kind of “unanticipated contingency” in the formal contract). This illustrative model can be adapted to demonstrate a simple version of this idea.

Assume that there are an infinite variety of potential tasks i ; the agent can choose an effort level e_i of L or H on each of these tasks $i = 0, \dots, \infty$. Third parties can verify whether the agent exerted high effort on “some” task—that is, whether $e_i = H$ for *some* i . However, *which* task the agent exerts effort on is not verifiable to third parties, though it is observable to the principal. For notational clarity, all e_i are observable, but what is verifiable is only aggregate effort E , defined as follows: $E = 1$ if there exists some i such that $e_i = H$; $E = 0$ otherwise.

There exists a “default task”, $i = 0$, which is both less costly to the agent and always unproductive. Other tasks are marginally more costly and sometimes productive. In each period, the agent and principal learn which effort among $i \in \{1, \dots, \infty\}$ is the productive effort i^* ; $e_{i^*} = H$ yields the principal gross project value $3v$ as before, with effort on all other tasks being completely unproductive and yielding no gross value

to the principal. Choosing $e_0 = H$ costs the agent v (the effort cost from all prior models), while $e_i = H$ for any $i > 1$ costs $v + \varepsilon$, where ε is vanishingly small. The efficient effort choice is therefore $e_{i^*} = H$ and $e_i = L$ for all $i \neq i^*$. The set-up is meant to capture the idea that the principal can formally contract for some effort (say, hours spent at work) but that whether this effort is productively adapted to the hard-to-describe details of the principal's needs, which is only marginally costly to the agent, is noncontractible. Shirking in this context may mean either delivering high effort on an unproductive task ($e_0 = H$) or delivering no effort at all ($e_i = L$ for all i).

A formal contract alone cannot induce efficient effort because the agent's compensation cannot be conditioned on whether the agent provides productive effort tailored to the principal's needs (which is required in order to induce the agent to incur the incremental cost ε required to provide such effort).

A pure relational contract, following the logic of the models developed above, will involve the principal promising a bonus $b = 2v + \frac{\varepsilon}{2}$ when the agent chooses high effort on the appropriate task ($e_{i^*} = H$) and nothing otherwise, with the agent promising to choose high effort on the appropriate task, and both parties agreeing to revert to formal contracting forever if either defaults on the relational contract. (The " $+\frac{\varepsilon}{2}$ " that has crept in reflects the need for the principal to compensate the agent for the higher effort cost, less the agent's half of the diminishment of the total surplus; of course, this is effectively 0 by assumption.) As a result, the analysis goes through just as in subsection 2.2; the relational contract supports efficient effort for $\delta \geq \frac{2}{3}$. Note in particular that the availability of the aggregate effort E as a contractible measure plays no role in feasible relational contracts because it is redundant to the observable individual efforts.

A relational contract coupled with a formal contract can do better. The formal contract here can condition payments on aggregate effort E , inducing the agent to undertake effort H on *some* task even if, absent the relational contract, that would be the unproductive task 0. Consider a formal contract that turns the entire bonus calculated above into a formally contracted payment conditioned on the verifiable exertion of aggregate effort ($E = 1$), and couple this with a relational component that simply conditions future contracting on the agent's choice of high effort on the productive effort ($e_{i^*} = H$). This yields the following incentive constraints.

For the agent, $IC_1(A)$ considers deviating by exerting no effort, while $IC_2(A)$ considers deviating by exerting effort on the unproductive (but less costly) task 0.

$$IC_1(A) : \quad 0 + \frac{\delta}{1-\delta}(0) \leq 2v + \frac{\varepsilon}{2} - v - \varepsilon + \frac{\delta}{1-\delta}(2v + \frac{\varepsilon}{2} - v - \varepsilon)$$

$$IC_2(A) : \quad 2v + \frac{\varepsilon}{2} - v + \frac{\delta}{1-\delta}(0) \leq 2v + \frac{\varepsilon}{2} - v - \varepsilon + \frac{\delta}{1-\delta}(2v + \frac{\varepsilon}{2} - v - \varepsilon)$$

$IC_1(A)$ obviously holds because there is not even a short-run advantage (given the formal contract for payment on aggregate effort) to choose no effort at all. $IC_2(A)$ can be rearranged to yield $\varepsilon \leq \frac{\delta}{1-\delta}(v - \frac{\varepsilon}{2})$. That is, the short run gain from not expending the marginal cost ε to tweak the effort to be productive must be smaller than the future value of the relationship. For diminishing values of ε , this clearly holds for all discount factors $\delta > 0$.

Because the principal's payment to the agent is fully specified in the formal contract, the principal effectively has no incentive constraint at all. The principal's only chance to deviate from the relational contract is to stop contracting with the agent despite the agent's adherence to the relational component of the contract. This is clearly self-defeating and unprofitable.

Proposition 7 *In this model, a hybrid formal-relational contract that formally conditions the principal's*

full payment to the agent on verifiable aggregate effort implements efficient effort for all positive discount factors. A formal contract alone cannot implement efficient effort, while a relational contract alone implements the efficient effort level only for discount factors $\delta > \frac{2}{3}$. Thus, hybrid contract implements efficient effort when neither formal nor relational contracts alone can do so. In this sense, formal and relational contracts are complements.

3 Theoretical literature

The interactions between formal and relational contracts explored in the literature are of course always quite specific to the model being examined. My goal is to distill a few common themes from this literature, appealing along the way to the results derived in the simple theoretical model above. In the process, I will barely scratch the surface of the insights of particular papers, but the goal is to create a sort of roadmap to this literature that will empower the reader to more efficiently navigate and explore it.

There is a simple, important dichotomy that arises in this literature, which manifests itself as the question of “Are formal and relational contracting substitutes or complements?” The central goal of this section is to illuminate what this means and how the literature has answered this question. The first two subsections briefly summarize papers in which formal and relational contracts are substitutes, while the third describes models in which they are complements. A variety of less closely related papers are discussed briefly in the final two subsections.

3.1 Models in which relational contracts may replace inferior formal contracts

The simplest notion of substitutability between formal and relational contracting arises in models where these are two alternative contract forms, each with some independently determined maximal surplus they can generate, with the contracting parties choosing the more efficient form. The core literature on relational contracting tends to consider environments in which formal contracts are extremely weak—for example, environments in which there is no verifiable signal of effort at all. As a result, that literature tends not to explicitly consider the interaction of formal and relational contracting. Rather, the emphasis in that literature is on the conditions under which relational contracts can support more efficient outcomes than the poor outcomes achieved with formal contracts in these settings. That is, they are considering a setting of substitution, identifying circumstances in which relational contracts do better than, replace, and substitute for, formal contracts. This is the theoretical idea captured in the simple model of subsection 2.2.

Examples of papers in this vein include the seminal papers on relational contracting, which include Bull (1987) and Macleod and Malcomson (1989). These papers demonstrate that it is sometimes possible to construct a self-enforcing relational contract in which a promised bonus (along with the promise of continued contracting) induces the desired effort on the part of the agent, while the promise of continued contracting ensures that the principal will in fact pay that promised bonus. When this is the case, the relational contract achieves better outcomes than are possible with a formal contract; as a result, it in effect replaces the formal contract. Macleod and Malcomson (1989) explicitly consider potential use of formal contracts and show that in their model a formal contract cannot improve the range of outcomes that are self-enforcing under an appropriate relational contract.⁴ Thus, relational and formal contracts are, in a sense, independent and

⁴In light of the discussion in later papers about the importance of a formal contract in ensuring an unconditional wage payment, it is important to note that in Macleod and Malcomson (1989) the potential for a principal to renege on an unconditional wage payment is ruled out by the assumption that the principal could simply pay the wage at the beginning of the period (without

separate approaches to solving the contracting problem. Alternatively, they can be thought of as substitutes in the sense that a wholly relational contract, when superior, completely substitutes for and replaces a formal contract.

Macleod and Malcomson (1998) consider a similar model that includes a more nuanced view of the labor market, allowing either jobs or workers to be in short supply and, therefore, outside options to be quite high for employers or workers, respectively. When workers are in short supply, the threat of firing is not meaningful, and workers therefore always shirk when compensated through a formal contract that can promise only unconditional wages and no performance pay. As a result, the relational contract does strictly better than the formal contract; it substitutes for and replaces the formal contract. When jobs are in short supply, the employer cannot meaningfully commit to paying performance bonuses because of the ease of replacing workers; instead, the firm relies on a the threat of termination while paying an efficiency wage to provide agent's incentives. The assumptions of the model render moot the question of whether that fixed wage is enshrined in a formal contract or not (for the same reason explained in the prior footnote relating to Macleod and Malcomson (1989)). In any case, formal and relational contracts are alternative ways of governing the relationship, with exogenous factors (here, labor supply-demand imbalances) determining which is preferable.

Kvaloy and Olsen (2009) endogenize formal contract completeness. By paying a cost, the formal contract can be made more complete, leaving less room for profitable deviation and relaxing incentive constraints in the relational contract. Stronger relational contracting (that is, a higher discount factor) increases surplus available to the parties at a given level of contractual completeness, allowing for more costly agent effort to be implemented. Optimally, the parties direct a portion of this slackening of incentive constraints to implementing costlier effort, but a portion is also directed to weakening the formal contract in the interest of achieving savings on contracting costs. Here, relational contracting and formal contracting are complements on the extrinsic margin (the two forms can do more together than either form can do alone), but they are substitutes on this intrinsic margin—the completeness of the formal contract is optimally reduced when the relational contracting is stronger.

Battigalli and Maggi (2008) consider relational contracts in the context of a richer set of formal contracts, which may take three forms. Every action and contingency that may arise is potentially verifiable and contractible, but at a contracting costs that varies with the completeness of the formal contract. Formal contracts may be contingent contracts that fully specify agent's actions ex ante for every contingency or specific contracts that specify the agent's action ex post of the observation of the contingency. (The model also includes a type of contract that starts out as a specific contract and becomes a contingent contract upon the bearing cost of specifying the contingencies upon the first need to do so, but this is not essential to understanding the essence of the argument.) More complete contracts are more costly to write. The parties trade off the costs of repeatedly writing specific contracts (specifying the agent's action each time) against writing, once and for all, a contingent contract (which requires the costly exercise of specifying the full set of contingencies). A relational contract may also be used, avoiding all costs of writing formal contracts. There are multiple tasks, and each may be governed by a different kind of formal or relational contract. For high discount factors, all elements are governed by a relational contract to avoid formal contracting costs. For low discount factors, all elements are governed by the more efficient type of formal contract, because the relational contract is not feasible. At these extremes, relational and formal contracts are substitutes; they are alternative ways of organizing the relationship, where formal contracting costs and discount factors

jeopardizing agent effort since the payment is unconditional).

determine which form is the more efficient way to organize the relationship. I return below to the case of intermediate discount factors in this model.

3.2 Models in which formal contracts can undermine relational contracts

A stronger form of substitutability arises when relational contracts are not only able to do a job that a formal contract cannot do, but actually rely on the absence of formal contracts for their efficacy. In this scenario, formal contracts are not undesirable alternatives that may be present but will not be chosen; rather they are by their very presence as an alternative a threat to the self-enforceability of a desirable relational contract. This is the theoretical idea captured in the simple model of subsection 2.3.

The idea that strong formal contracting can undermine relational contracting, is pervasive in the literature. This manifests itself in the literature in two ways. In some models, an exogenous variation in the strength of formal contracting is shown to affect the self-enforceability of relational contracts. This is the approach taken in the very simple model above. The second approach is to use this insight to then endogenize the optimal completeness of formal contracting, even showing that it may be optimal to sabotage the formal contracting environment in order to support relational contracting.

Two early papers demonstrate the point that strong formal contracts can undermine and/or prevent relational contracting. Baker, Gibbons, and Murphy (1994) consider a model with relational contracting on observable but nonverifiable effort or formal contracting on a verifiable but noisy signal of effort. In that context, strong formal contracting means very low noise in the signal of effort. They show that as the signal becomes very informative and less noisy, the formal contract dominates the relational contract. This is true both because the costs of using the signal fall (as it becomes less distortionary, the costs of those distortions fall) and because the relational contract is not sustainable when the formal-contract-only outside option for the firm is too attractive. Put differently, the relational contract is self-enforcing only when the contractible performance measure is bad enough, and the best formal contract therefore distortionary enough, that formal contracts alone are quite unappealing and the value of the continued relationship is significant.

Schmidt and Schnitzer (1995) consider the effect of allowing costly formal contracting on an otherwise noncontractible effort level in a simplified version of the Macleod and Malcomson (1989) model. They show that this option reduces the severity of credible punishments, tightening the incentive constraints required for the relational contract. As that contracting cost falls, eventually the outside option is too good and there is not enough incremental value left in the ongoing relationship to sustain a relational contract. As a result, the parties must settle for the lower payoff associated with costly formal contracting.

Sobel (2006) considers a model in which agents match and rematch in a repeated prisoner's dilemma, with the maximum value created in the relationship diminishing over time so that rematching is efficient. He considers the interaction of formal and relational contracting to show that relational contracting relies on imperfect formal contracting. Strong formal contracting allows both cooperation and efficient rematching. Relational contracting, in contrast, is feasible only when formal contracting is weak enough that rematching with a new partner is risky, ensuring that there is value to the continued relationship. Such relational contracts sustain cooperation but necessarily entail inefficiently low levels of rematching. As formal contracts gets stronger, the relational contract is undermined because the risk involved in rematching diminishes (ie, the negative consequences of exiting the existing relationship are no longer sufficient to satisfy the incentive constraint). Thus, this paper shows both that formal and relational contracts are alternative, substitute methods for organizing the relationship, and also that stronger formal contracts can undermine and ultimately prevent relational contracting.

MacLeod (2007) considers in section 6.1 this same question about the interplay of relational and formal contracting. Relational contracts are superior in his model, other things equal, because they avoid costly use of formal enforcement mechanisms. However, self-enforcing relational contracting requires sufficient gains from trade. Macloed shows that when gains from trade are high and costs of formal enforcement are high, efficient relational contracting is possible. However, as costs of formal enforcement fall, holding gains from trade constant at that high level, costly and inferior formal contracting eventually crowds out the efficient relational contract because the gains from trade in the ongoing relationship (relative to the surplus available from writing a new formal contract) become insufficient to ensure self-enforceability.

A related set of papers uses this insight to endogenize the optimal completeness of formal contracting. A number of papers argue that contracts are endogenously incomplete precisely because this leaves enough value on the table, or enough flexibility and recourse for the contracting parties, to enable desirable relational contracts. Bernheim and Whinston (1998) is the seminal paper in this literature. As they put it in their introduction, “if contracts must be somewhat incomplete..., then it is often optimal for parties to write contracts that are even more incomplete.” The first part of this claim refers to the presence of nonverifiable elements of the relationship; the second part refers to the decision not to write (formal) contracts on elements of the relationship that *are* verifiable. This paper is written in a more general theoretical framework that does not resemble standard agency models to the same extent as other papers surveyed here, but the basic point is easily illustrated. In a simple repeated principal-agent setting, it is often assumed that the agent’s effort is observable but not verifiable, while the principal’s payment to the agent is verifiable. If the principal’s payment is fully specified (for every period) in a formal contract, then the principal lacks the discretion (based on observation of the nonverifiable effort) to reward or punish the agent, and relational contracting is futile. Obviously, an effective relational contract cannot include a fully specified formal commitment of the principal’s payment to the agent, even though such a formal contract is feasible. The paper explores this idea in considerably more detail. Of particular interest is their result indicating that this endogenous incompleteness arises, as a general rule, in settings of strategic complementarity—that is, when one party’s “cooperative” action makes the other party’s “cooperative” action more attractive. In general, agency settings are often characterized by such strategic complementarity, as in the example just given: the principal’s (conditional) payment of a bonus makes it more appealing for the agent to exert high effort.

Schottner (2007) makes a similar point in a model that more closely resembles the set-up of Baker, Gibbons, and Murphy’s (1994) primary model (section III of their paper). She pursues the question of job design—ie, the allocation of tasks across agents—in the context of the classic multi-task model with an imperfect contractible performance measure. As in Baker, Gibbons, and Murphy (1994), she shows that the self-enforceability of relational contracts benefits from distortionary contractible performance measures that weaken formal contracting. In her model, the principal, who chooses task allocations, may actually combine tasks in the job of a single agent in order to deliberately create a multi-task problem for that agent, which in turn undermines the strength of formal contracting and increases self-enforceability of the relational contract. Put differently, the principal may forgo opportunities to eliminate distortions in formal contracting because these would undermine the relational contract. The principal manipulates, through job design, the contracting environment in order to diminish the quality of formal contracting and render relational contracts self-enforcing.

Baker, Gibbons, and Murphy (1994) demonstrate a similar result in their classic model. In section IV of their paper they consider the possibility that the principal can assess the distortions caused by a contractible performance measure. They show that, in a repeated contracting setting, the optimal relational contract

may forgo any formal contracting on the contractible performance measure, even though it is feasible, opting instead for what they term subjective weighting of an objective performance measure. Here, again, the optimal contract may necessarily forgo the full extent of formal contracting that is possible.

3.3 Models in which formal contracts facilitate relational contracting by relaxing incentive constraints

The primary argument for a relationship of complementarity between formal and relational contracts focuses on the short-run incentives to deviate from the relational contract. Since the short-run deviation from the relational contract is still subject to any transfers or other actions mandated by the formal contract, the formal contract can alter the short-run deviation possibilities. In particular, if the formal contract can be used to limit the short-run gains of deviation from the relational contract, then this will relax the incentive constraint and make relational contracts more enforceable—that is, make relational contracts able to support an outcome closer to the efficient outcome or allow relational contracts to be self-sustaining at lower discount factors.

In the simplest case, as in the model of subsection 2.4, the formal contract might just be a commitment to an unconditional payment from the principal to the agent. In other cases, as in the model of subsection 2.5, the formal contract may be conditional on imperfect or incomplete performance measures. In either case, the principal’s short-run gain from deviation from the relational contract is reduced by moving some of the promised payment from a discretionary (relationally contracted) bonus to a formally contracted payment (either an unconditional wage or performance pay conditioned on an imperfect contractible performance indicator). By using the formal contract to limit the principal’s deviation profits, the principal’s incentive constraint can be relaxed, allowing increased relational contracting.

The classic paper in this vein (closely related to subsection 2.5) is Baker, Gibbons, and Murphy (1994). In their standard model, there are both verifiable and nonverifiable performance measures. The verifiable measure is imperfect and distortionary, making strong relational contracting on the nonverifiable measure appealing. However, when (for example, with modest discount factors) the principal cannot commit credibly in the relational contract to pay the required bonus, the relational contract may benefit from some formal contracting. In particular, the optimal contract may involve some formal compensation tied to the distortionary, verifiable measure, which maintains agent incentives and also relaxes (since the payment is part of the formal contract) the principal’s incentive constraint. As a result, better outcomes can be sustained by using formal and relational contracting in combination than can be sustained through the use of either of the two types of contract alone.

Schmidt and Schnitzer (1995) consider a multi-task model in which one of two efforts becomes contractible. They show that this has an ambiguous effect on relational contracting because it both lowers the deviation payoff (strengthening relational contracting) and raises the formal-contracts-only outside option (which undermines relational contracting). In some cases, this can create a situation in which relational contracts and formal contracts are complements in the sense that stronger formal contracting allows the parties to sustain relational contracting when they otherwise could not.

Pearce and Stacchetti (1998) arrive at a similar result in a model that features risk-averse agents and allows more sophisticated conditional bonuses (which may depend on the verifiable outcome as well as the unverifiable outcome). They show that optimal contracts involve the use of both formal and relational contracts. The formal contract helps limit the principal’s temptation to renege (“seize” in their language) the relationally contracted bonus, while preserving some relationally contracted bonus helps to strengthen agent

incentives. They emphasize that though formal and relational contract are complements in this sense, the size of the relationally contracted bonus varies inversely with the size of the formally contracted payment; this helps to smooth payments to the risk-averse agent while preserving strong incentives.

Levin (2003) provides a wide-ranging synthesis in a canonical relational contracting model, incorporating general treatment of issues such as stationarity, the simplicity of optimal bonus payments, and the effect of hidden information. In his model, this same point emerges: optimal contracts involve using both formally contracted unconditional wages and relationally contracted conditional bonuses, with the formally contracted wage playing a critical role in allowing the contract to maximize the agent's incentives without violating the principal's incentive constraint in the relational contract.

Daido (2006) considers a multi-task model in which one effort is verifiable and the other is observable but unverifiable. The optimal contract for all but the most patient firms involves the simultaneous use of formal and relational contracting where the formal contract commits the principal to payments that provide effort incentives to the agent without increasing the burden on the principal's incentive constraint. In this model, efforts are substitutes in the cost function but independent in productivity. As a result, not only are formal and relational contracting complements in the sense that they are used together in the optimal contract, but the magnitude of formal and relational performance pay move together as well. As relational contracting gets stronger, the relationally contracted incentive on the unverifiable task gets stronger; as a result of substitutability in the cost function, the optimal contract raises the incentive on the formally contracted task as well. This is yet another sort of complementarity of formal and relational contracting.

Itoh and Morita (2015) study a setting in which an agent makes a specific investment that is unverifiable and which reduces the agent's outside option (customizing the product for the buyer reduces its value on the open market). In this case, when the discount factor is too low to sustain relational contracts alone, they show that allowing the buyer to also use a formal contract to guarantee a fixed payment regardless of (noncontractible) investment mitigates the buyer's deviation payoffs. This can effectively neutralize the outside option-lowering effect of the investment and restore the possibility of self-enforcing relational contracts that support efficient specific investments. Here, again, formal contracts used to limit deviation payoffs are powerful complements to relational contracting, and formal and relational contracts used together can support better outcomes than either contracting form used alone.

The Battigalli and Maggi (2008) paper discussed in section 3.1 also exhibits a complements logic in a model with multiple tasks. The earlier discussion in this paper described how less costly relational contracts could displace formal contracting in that model. However, in this model the substitutes-or-complements question is in fact more nuanced. For intermediate discount factors, the optimal contract includes both elements governed formally and elements governed informally. Other things equal, higher cost-of-effort tasks are governed by formal contracts, because they are the tasks for which the agent's incentive contract is the strictest in the relational contract. That is, the costly formal contract can take pressure off of the relational contract incentive constraint for the tasks where the relational contract is most difficult to sustain. For that one task, then, the two modes of contracting remain substitutes—the task will be governed by one form or the other. However, with respect to the entire suite of contracted tasks, formal and relational contracting are complements because the use of costly formal contracting for some tasks enables relational contracting *for other tasks* to be self-enforcing at intermediate discount factors when it would not otherwise be self-enforcing. That is, the ability to use a formal contract on some tasks enables relational contracting on other tasks, allowing the implementation of an effort profile that would not be implementable with a relational contract alone. In this sense, the two forms act as complements, together achieving something that neither form can

achieve alone.

In many of these models that emphasize the use of relational and formal contracting together, the formal contract plays a role specifically in limiting the principal's incentive to default on the promised incentive payments to the agent. It is also possible to use the formal contract to strengthen the agent's incentive beyond the available implicit incentives, allowing the implementation of agent effort closer to the efficient level.

Iossa and Spagnolo (2011) consider a setting in which there are, in addition to productive noncontractible tasks, inefficient or unproductive contractible tasks. They allow discretionary enforcement of formal contracts, and argue that discretion over whether to enforce a formal contract is, in effect, a way of expanding the immediate and court-enforceable cost of deviating on a noncontractible task. The formal contract can require the agent, for example, to undertake a costly verifiable action that is nonproductive, as well as costly unverifiable actions that are nonproductive. With a purely relational contract on the unverifiable productive action, the worst deviation payoff that can be sustained is the one achieved by termination of the relationship. However, with discretionary enforcement of a formal contract, the principal has available the option to enforce the formal contract, which imposes court-enforceable and immediate costs on the agent. Thus, the discretionary enforcement of the formal contract can reduce deviation incentives, facilitating and strengthening relational contracting, even in settings where no productive tasks are verifiable and therefore formally contractible.

While it is not exactly a relational contracting model, Gibbons and Murphy (2002) demonstrate another result related to the agent's incentives in a career concerns model. They show that the principal can improve on the implicit incentives of career concerns alone by using formal incentive contracts in addition. In particular, the formal contracts allow a strengthening of incentives in later periods when career concerns diminish due to the agent's finite horizon. This is suggestive of the general theme that the two modes of contracting together are more powerful than either mode alone. In this model, this is at least in part the result of the fact that a market equilibrium determines the strength of the career concerns incentive, so the implicit incentives are not directly under the control of the principal.

3.4 Models emphasizing adaptation and renegotiation

Other papers consider models in which information revealed over the course of a transaction creates opportunities for recontracting and renegotiation on the equilibrium path (that is, not as part of a punishment phase); in such settings, formal and relational contracts both set the stage for and determine the outcomes of that future recontracting and adaptation. As a result, relational contracts may make more desirable otherwise too-rigid formal contracts that have high recontracting costs; alternatively, formal contracts may limit the scope of renegotiation in a setting that otherwise leaves too much room for hold-up. In such cases, formal and relational contracts can often work together as complements to sustain better outcomes than either contract type alone.

Banerjee and Duflo (2000) consider a reputation model rather than a true repeated-game relational contracting model, but the spirit is similar in that observable but nonverifiable actions determine future contracting prospects. They consider projects that evolve in real time, creating opportunities for opportunism under either fixed-price (opportunism by the buyer, who demands more work for the fixed price) or cost-plus contracts (opportunism by the seller, who can run up large additional bills). They show that the type of formal contract is chosen to limit the scope for opportunism by the partner subject to weaker discipline by the relational contract (ie, the party with a weaker reputation).

Corts (2012) models the choice between two kinds of procurements contracts, fixed-price and cost-plus. The more completely specified formal contract (fixed-price) provides stronger incentives, but also is rigid and creates opportunities for hold-up and costly renegotiation when the desired project specifications change during the project. In contrast, the more flexible cost-plus formal contract has weak incentives. The analysis shows that stronger relational contracting (increasing discount factor) leads to increased use of the lower-powered and less-complete cost-plus formal contract because the deviation temptations are too great to sustain a relational contract when the formal contract opens up large renegotiation opportunities.

Gil (2013) develops a model in which relational contracting provides appropriate flexibility and is self-enforcing under normal circumstances, but where exceptionally successful projects may lead to very profitable deviation possibilities, leading to a breakdown of the purely relational contract. This can be solved by incorporating formal contracts that constrain the deviation possibilities when exceptional circumstances arise that the relational contract cannot handle effectively.

3.5 Other mechanisms

A variety of more recent papers explore still other mechanisms by which formal and relational contracts may interact, typically emphasizing ways in which formal contracts can facilitate relational contracting in circumstances where it otherwise might not be feasible. One possibility is that relational contracting and formal contracting interact through their effects on the punishment phase of the relational contract. Li and Matouschek (2013) develop one such model, in which formal contracts are not critical to satisfying the incentive constraints through effects on short-run deviation profits, but rather through effects on payoffs in the optimal punishment phase.

Other papers examine models with hidden types, where the incentive constraints in the relational contract are complicated by the need to accommodate the fact that different agent types (which are private information) have different incentives to deviate from any particular contract. This in general makes relational contracting harder to sustain or distorts implemented effort levels. This can create an interaction of formal and relational contracting. For example, Halac (2012) studies a model with asymmetric info on type. There is formal and relational contracting, but also revelation of type over time. The two types of contracts work together (the formal contract's wage and the relational contract's bonus) to optimally satisfy incentive constraints; as the agent's type is revealed, the balance tilts toward using relational contract. Gurtler and Gurtler (2014) also develop a model with hidden types. In their model, formal contracts aid in separation of types, which in turn facilitates relational contracting.

4 Empirical literature

Empirical work seeking to explore whether formal and relational contracts act as complements or substitutes faces a number of difficulties. There are definitional and measurement issues with respect to both formal and relational contracts. With respect to formal contracts, what does it mean to say (and how does one observe) that the parties are “doing more formal contracting”? With respect to relational contracts, how would one ever observe *any* relational contract, much less determine whether parties were doing more or less relational contracting? In addition to these definitional and measurement issues, there are of course difficult methodological issue around identification: given that trading partners and contract form are both endogenously determined (including in response to a host of unobservable characteristics of both trading

partners and transactions), how does the observer disentangle cause and effect and make inferences about counterfactuals and causation?

In general, the empirical literature has explored the substitutes/complements question by asking, “when the conditions for relational contracting are more favorable (typically, the parties contract more frequently), do their formal contracts become stronger or weaker?” In this context, a “stronger” formal contract means one that, other things equal, has larger conditional incentive payments, is more detailed in its description of the transaction, more fully specifies how the parties will treat various contingencies that may arise, specifies behavior over longer terms, or is stronger in some other similar intuitive sense.

There are a number of important identification challenges in such work, but chief among them is the problem of endogenous matching. A party seeking to execute a transaction to govern a trade with particular characteristics (and thus a particular level of contracting hazards) chooses both the trading partner and the contract form in order to most efficiently govern the transaction. As a result, it is plausible that a buyer, say, would choose to contract for production of a component with particular high contracting hazards (for example, its design requires specific investments, sharing of intellectual property, and ex post revisions to the specifications) by contracting with both a particular kind of seller and using a particular kind of contract. For example, the buyer might choose an established seller that it trusts (lots of repeated contracting) and a strong formal contract (highly detailed and complex) to govern this difficult transaction, but this does *not* mean that the availability of repeated contracting is causing the choice of a strong formal contract.

The empirical literature varies in its attention to this problem. Many of the papers mentioned below simply document correlations. Some use nuanced arguments about the context to argue for inferences of causality. Others use instrumental variables and other econometric techniques to address this problem. Gil and Zanarone (forthcoming; 2017) provide nice surveys of empirical challenges and approaches in this literature. Corts and Singh (2003) and Corts and Martinez (2018) provide the clearest discussion of the identification challenge and examples of how to use IV strategies to address endogenous matching.

A literature in management journals focuses heavily on the *complexity* of formal contracts. It asks how this correlates with indicators of relational contracting, which here may include frequency of interaction but also indicators such as perceptions of trust, mechanisms for information sharing, and so on. For the most part, these papers find a positive correlation of relational contracting and formal contract complexity, indicating a relationship of complementarity. In general, these papers are not particularly concerned with identification and causality, but focus on documenting correlations that indicate how contracting practices more together. In some cases, this is explicitly not a causal link, but rather interpreted as a shared reaction to a common cause (eg, both relational and formal contracting get stronger as contracting hazards increase).

Poppo and Zenger (2002) find that among IT services contractors, more complex formal contracts are associated with greater relational contracting, measured as the presence of repeated interaction, information sharing, and perceived mutual dependence and trust. Mayer and Argyres (2004) find, in a single relationship between firms in the personal computer industry, that formal contracts become more detailed and complex over time in a way that cannot be explained by characteristics of the transaction. Argyres, Bercovitz, and Mayer (2007) study a large IT services provider and find that repeated contracting is associated with more detailed and complex formal contracts, controlling for other features of the job. In a study of Chinese manufacturing firms, Zhou, Poppo, Yang (2008) show that an increase in contracting hazards leads to both more reliance on relational contracting (here, working with partners where survey evidence indicates a sense that the partners share cooperative norms, etc) and more complex formal contracts. Ryall and Sampson (2009) study joint technology development contracts between telecommunications companies and

find that repeated prior contracting is associated with more complex formal contracts, though intensity of contemporaneous contracting is associated with less complex formal contracts. Vanneste and Puranam (2010) find in their study of IT services and procurement contracts that contracts are more technically complex in the presence of repeated contracting.

Papers in the economics literature tend to focus on other features of the formal contract rather than “complexity” per se. Several papers look specifically at the choice between fixed-price and cost-plus (or time-and-materials) procurement contracts. Banerjee and Duflo (2000) study Indian software firms and find that parties engaged in repeated bilateral contracting show no difference in choice of contract type; however, more established firms (who are likely to have a reputation in the industry, their proxy for the strength of relational contracting) are more likely to have lower powered, more flexible time-and-materials contracts. Corts and Singh (2003) study the offshore drilling industry; they find that parties engaged in repeated contracting choose lower powered, more flexible cost-plus contracts. Kalnins and Mayer (2003) study a similar question in IT services contracts and find that when parties engage in repeated contracting they choose lower powered, more flexible cost-plus contracts.

Other papers in the economics literature focus on other features of the formal contract. Corts and Martinez (WP) focus on contract length (longer formal contracts being the indicator of “stronger formal contracting”) in their study of the Costa Rican coffee market. They find that parties engaged in repeated contracting tend to use longer-term formal contracts. Gil (2013) focuses on the use of formal contracts that contain price provisions that constrain informal bonus payment between Spanish movie distributors and exhibitors. He finds that when contracting hazards are higher the contracting parties complement informal contracts with formal contracts as well.

There also exists in the economics literature a set of papers that focus not on contract *choice* per se, but rather on the effect of relational contracting on formal contracting *outcomes*. This is of course complementary to the question of contract choice in the sense that if relational contracting improves enforceability of formal contracts, formal contracts presumably become more attractive and are chosen more frequently. For example, Machiavello and Miquel-Florenza (2017) study the Costa Rican coffee market and find that parties engaged in repeated contracting default less on their formal contracts. Johnson, Woodruff, and McMillan (1999) study the extension of credit in formerly communist economies and find that better court enforceability implies higher repayment rates on credit for newly formed contracting partnerships (a result about formal contracting), but that this pattern does not hold in established relationships (a result suggesting that relational contracting effectively substitutes for formal enforcement).

5 Conclusion

I hope that this survey is successful in conveying three primary messages, with the effect that it stimulates and encourages further study of the important and ubiquitous issue of the interaction of formal and relational contracting. First, this issue is important. Every formal contract arises in a social and relational context, and this context inevitably informs the understanding, expectations, outside options, and other perspectives that the contracting parties bring to the transaction. The complexity of that interrelationship may seem daunting, whether you are considering it first from a real-world contracting context or whether you are approaching it from reading the theoretical literature. However, my second aspiration for the survey is that the simple theoretical models demonstrate that, despite the complexity evident in the literature, the basic logic of the key mechanisms by which relational contracting and formal contracting interact is accessible and

intuitive. Third, despite deep conceptual challenges with observing and measuring something as subtle as relational contracting, it is possible to do compelling and important empirical work on this subject. The literature can only benefit from additional attention to the social and relational contexts in which formal contracts are negotiated, signed, enforced, and renegotiated.

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