

Contracts as Threats: on a Rationale For Rewarding A while Hoping For B^*

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Abstract

Contracts often reward low-value tasks and are not enforced ex post. We provide an explanation exploring theoretically the relationship between explicit contracts and implicit agreements, distinguishing between the ex-ante decision to sign a contract and the ex-post decision whether to apply it. We show that it is often optimal to have *overcontracting*, i.e., contractual clauses requiring costly verifiable tasks (A) to one party of little value for the other party, not enforced in equilibrium. The ex-post (non)implementation of such clauses can be exchanged against the provision of highly valuable but noncontractible tasks (B). Overcontracting also facilitates relational contracting when exchanges are repeated. It strengthens punishments following deviations and it allows organizations where 'discretionary' transfers are banned to indirectly pay for non-contractible tasks. The model also explains why stipulated damages must be moderate in size. These results apply independently of whether B is a 'productive' task or a 'bribe'.

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1 Introduction

The puzzles. Since Kerr's (1974) amusing list of examples and Holmstrom and Milgrom's (1991) pioneering analysis, it is well known that explicit contracts often reward low value (if not dysfunctional) easy-to-verify tasks apparently at the expense of more valuable but hard to monitor ones. It is probably less well known that often real world parties do not enforce explicitly contracted provisions. The puzzle is therefore twofold: Why tasks of little or no value are often contractually specified? Why penalties for noncompliance are often not exercised? In this paper we propose an 'optimistic' joint explanation for these puzzling observations based on the interaction between explicit contracts, the choice whether to enforce them, and implicit agreements on non-contractible trade dimensions.

Examples abound. In many organizations, employees are contractually required to arrive at work every day at a certain time and to stay until another time. When physical presence does not facilitate monitoring and the task can be as efficiently performed at home (think about creative non-team tasks) this is of little value for the organization. And many organizations then do not enforce these contractual clauses but allow instead flexible working hours. Similarly, in several European countries (Germany, Italy and France) professors' contracts establish a large number of teaching hours. However, universities do not always apply these clauses: individual teaching loads and administrative duties are often informally reduced. In public procurement, contractual penalties for noncompliance typically do not benefit the party enforcing them because they end up in different budgets of the public administration, and are often waived.¹ At the level of the social contract, laws and regulations can be seen as the explicit part of the agreement and it is self evident that in many countries plenty of laws and regulations are often not enforced, and would be of little social value if they were. "Work-to-rule" practices, or "white strikes", where a literal application of explicit contracts is used by workers to block manufacturing plants when fighting against management, reveal that labor contracts are also typically not fully enforced and contain

¹For example, third-party inspections commissioned by the Italian Public Procurement Agency (Consip) in the period 2005-2008 showed that on a total of 1455 ascertained infringements by a contractor, remedies/penalties were only enforced in 64 cases, i.e. for less than 5% of the ascertained infringements. Analogous anecdotal evidence exists for large procurement of complex services in the UK (HM Treasury, 2006).

worthless or dysfunctional clauses.²

This paper. We analyze the interaction between explicit contracts and implicit agreements from a novel perspective, one emphasizing the difference between the ex-ante decision to sign an explicit contract and the ex-post decision of actually enforce all its clauses. While contract renegotiation has been subject to extensive inquiry, to our knowledge the possibility of signing an explicit contract and then simply ignoring (some or all) its clauses has by and large been neglected in the literature.³

Our model shows that contractual clauses requiring provision of costly but low-value tasks may be optimally signed ex ante, not be enforced in equilibrium, and effectively used as ‘threats’ to facilitate informal agreements on valuable but noncontractible tasks. Consider for example a principal and an agent interested in trading on a valuable but non-verifiable task (B). The principal and the agent can sign an explicit contract requiring the agent - in exchange for some payment from the principal - to perform a completely different task (A) that is verifiable, costly for the agent, but of no value for the principal. They can then agree that, as long as the agent provides the noncontractible task B , the principal will not enforce the contract on A . With A costly enough, the agent will then choose to provide B , and with A valueless, the promise of the principal will be credible. The optimal explicit contract thus exhibits *overcontracting* on costly verifiable tasks (or task levels) of little apparent value for the principal.⁴

The reasoning above offers a rationale for the puzzles discussed earlier: organizations do not enforce contractual provisions on working hours for committed and collaborative employees, but they might apply them to punish those who behave op-

²See <http://libcom.org/organise/work-to-rule> for a nice up-to-date explanation of the practice from direct users, where one also reads the following: *"Almost every job is covered by a maze of rules, regulations, standing orders, and so on, many of them completely unworkable and generally ignored. Workers often violate orders, resort to their own techniques of doing things, and disregard lines of authority simply to meet the goals of the company. There is often a tacit understanding, even by the managers whose job it is to enforce the rules, that these shortcuts must be taken in order to meet targets on time."*

³A notable exception is Doornik (2008), who considers the possibility of not enforcing an existing explicit contract ex post when the cost of enforcement turns out to be larger than its benefits.

⁴Analogous reasoning applies if there are contract enforcement costs. Then the explicit contract must be on contractible tasks A that has a value for the principal. With a value of the same magnitude as the enforcement cost, the promise to enforce the contract if and only if the agent deviates from the implicit agreement is credible.

opportunistically. European universities accommodate teaching reductions for academics as long as they excel in research or are particularly collaborative on other activities that are hard to specify in a contract or verify for a court. Civil servants managing public procurement contracts may not apply penalties/deductions (that have little direct value for them because they typically end up in other budgets of the public administration) as long as contractors behave cooperatively on noncontractible dimensions of the supply, but may start enforcing them if they behave opportunistically.⁵ Governments may not normally enforce inefficient laws, unless it helps them to deal with e.g. ‘troublemakers’.⁶

A reinterpretation of the model implies that contracts as threats are also effective if a task A is costless for a party to undertake but generates a loss to the other party. Here one party is punishing the other by applying his own contractual obligations that are dysfunctional for the other party. This is the case of work-to-rule practices: workers normally (i.e. in equilibrium) disregard dysfunctional contractual clauses in order to smooth and speed up production, but during white strikes they apply them to block production and punish managers that did not stick to promises.

The results. Our model highlights two distinct effects of overcontracting, both of which help parties to govern trade on valuable but noncontractible tasks. The first one is a *short-run effect* relevant even for one-shot or occasional transactions. Contractual clauses requiring costly but low-value tasks and used as threats can transform a Prisoner Dilemma’s stage-game into a sequential game. Parties get the option to react to a deviation on the noncontractible task and punish it by calling for the application of the contract as soon as the deviation is observed. The second, more familiar effect of overcontracting is a *long-run one*: when the exchange is repeated in time, inefficient contractual clauses can strengthen the punishment phase that disciplines defections and facilitate relational contracting.

⁵The importance of the interaction between explicit and relational contracts emerges clearly in HM Treasury (2006): “*The Government believes that the relationship between the public and private sector in a PFI project must always ultimately be contractual but should be overlaid with partnership working to ensure that operations are effective. In order to encourage this approach the Government will promote the development of a partnership agreement or shared vision document that sits outside of the actual PFI contract. This would not be legally binding but would set out the parameters of the public sector and private sector working relationship and spell out in some detail how the contract will be managed in practice.*”

⁶Discretion in the enforcement of contractual clauses opens of course the door to abuses, as will be discussed shortly.

An important aspect that emerges from our analysis is that a main advantage of overcontracting is its ability to make *utilities non-transferable*. Because contract enforcement can be costly to the agent but valueless to the principal (or vice versa), contracts can discipline one party without increasing the temptation to defect of the other. For this reason, in our set up without contracting costs *overcontracting always dominates standard relational contracting* where incentives are provided through discretionary monetary transfers, like performance bonuses, or by rents and the threat of separation. Since monetary transfers and rents are transferable, they can discipline one party but only at the cost of increasing the temptation to defect of the other. For this same reason, overcontracting has also distributional implications: a principal with bargaining power can use it to implement the efficient relational contract without leaving any rent to the agent even when performance bonuses are not viable.

An important aspect of our analysis is that it offers an explanation *why penalties for contract infringement are often rather low*, although effective enforcement of contracted obligations would suggest to set them high (Becker 1968, Abreu 1988). Distinguishing the choice of signing a contract from that of applying its clauses ex post makes it clear that in a long-term relationship with overcontracting increasing penalties for non-compliance by the agent reduces his incentive to defect, but it raises the principal's one. In order not to tighten the principal's incentive constraint, contractual penalties for infringements are optimally bounded above by the cost of the contracted action for the agent.

Of course, as with many other contractual commitments, the possibility of swift and cheap renegotiation reduces the benefits of overcontracting. However, the possibility of renegotiating the explicit contract at the end of each period, as traditionally assumed in the literature on relational contracts, does not entirely undermine the benefits of overcontracting. The within-period short-run effect remains: even when end-period renegotiation is fast and costless, overcontracting brings the benefit of transforming simultaneous-move stage games (like a Prisoner's Dilemma) into sequential-move games (like a Trust Game) where defections can be punished within the period in which they occur.

These results are general, but they are particularly relevant for large firms and public organizations subject to what we call '*bureaucratic control*', i.e. formal accountability rules that do not allow their members to operate discretionary monetary payments that have no verifiable counterpart, like an explicit supply contract that justifies the

payment. By limiting discretion, bureaucratic control makes ‘standard’ relational contracting impossible (as forcefully argued by Kelman, 1990). However, while auditing the correspondence between explicit contracts and relative payments is relatively easy, as it is in the books, verifying whether all contractual clauses have then been effectively respected and, if not, whether contractual remedies have been effectively enforced, is much more difficult and rarely done. Bureaucratic control thus hinders standard relational contracting, but not relational contracts sustained by overcontracting, as this does not make use of discretionary payments. In fact, here an additional value of signing but not applying explicit contracts arises, namely the use of the *non-enforcement of contractual clauses as ‘means of payment’*, as reward for complying with an implicit agreement when direct payments cannot be used.

We wrote above that we give an ‘optimistic’ explanation as to why low-value contractual clauses are often signed but not applied. We focus on benevolent actors and on the enforcement of ‘productive’ noncontractible tasks B ; but of course discretion in (private or social) contract enforcement may be abused for private purposes. Indeed, all our results can readily be re-interpreted from a much less optimistic point of view: the principal could be a non-benevolent agent of a large firm or public organization exploiting his discretion by extracting B-ribes or other private B-enefits in exchange for not enforcing explicitly contracted clauses between his organization and outsiders. Similarly, a government in charge may abuse its ability to enforce inefficient laws only in selected situations to illegally damage the opposition. As productive nonverifiable tasks, illegal exchanges must also be part of a self-enforcing implicit agreement sustained by credible threats. And the discretion on the ex-post enforcement of low value contractual provisions can equally enforce productive and corrupt deals.⁷

The structure of the paper. We review the related literature in Section 2. In Section 3, we consider a simple Prisoner’s Dilemma game where two parties must choose whether to cooperate or defect and highlight the value of explicit contracts as threats when the game is one-shot and when it is repeated. In Section 4 we apply our ideas to a repeated Principal-Agent relationship in order to discuss aspects of real word relationships where contracts as threats may play an important role. Section 5 briefly concludes. All proofs are relegated to an Appendix.

⁷This similarity between non-contractible tasks and corruption is Banfield’s (1975) conclusion that, in order not to loose too much non-contractible quality through rigidity some discretion, and therefore some corruption should be optimally tolerated in well run bureaucracies.

2 Relation to the literature

Our work can be seen as a contribution to the economics of ‘multi-tasking’ and ‘job design’ sparked by the seminal work of Holmstrom and Milgrom (1991). That paper stressed that when some tasks are easy to contract upon whilst others are not, providing high powered incentives on the contractible tasks may lead the agent to disregard the less contractible but important task. This result has been often related to Kerr’s (1975) classic management science piece on "the folly of rewarding A when aiming for B ". On the contrary, after recognizing that signing and enforcing explicit contracts are distinct decisions, our results show that high powered incentive contracts on valueless tasks (A) may emerge as the best instrument to elicit effort on valuable but noncontractible tasks (B).

The paper also contributes to the literature on modes of economic governance.⁸ In particular, in a somewhat less known contribution Williamson (1983) discusses a third governance mode besides integration, explicit contracting and relational/reputational forces: credible commitments through the "exchange of hostages" between parties. The characteristics of a ‘good hostage’ are to be valuable to one party and valueless to the other, who can then credibly promise to return the hostage or keep it, depending on the first party’s behavior. This makes utility non-transferable, precisely as contracts as threats. Explicit contractual clauses that, if enforced, impose costs to one party but produce little benefit to the other can indeed be seen as fostering cooperation by making parties hostages of each other.

From a theoretical point of view the first mechanism we unveil is reminiscent of the ability of ‘latent contracts’ to curb moral hazard, as first discussed in Hellwig (1983); and of how options and other simple contracts solve the ‘hold up’ problem in Noldeke and Schmidt (1995) and Evans (2008).⁹ The difference is that latent contracts are never actually signed in equilibrium, and that option and other simple contracts are signed but always enforced. None of these mechanisms helps therefore explain the stylized facts we are focussing on here, where inefficient contractual clauses are signed but then not enforced. Related to our work is also the idea, informally stressed by Masten (2000), that to affect the outcome of renegotiation, parties may sometimes include contractual

⁸See Williamson (2005) and Dixit (2009) for recent overviews.

⁹The sequentiality induced by contracts as threats also relates them to the mechanisms for subgame perfect implementation studied by Moore and Repullo (1988). We are grateful to Bob Gibbons who let us note this parallelism.

provisions that have little to do with what their actual intentions are. In our set up parties do not use ‘strange’ contractual clauses to affect renegotiation, but rather as credible threats and means of payment to trade on noncontractible dimensions.

The dynamic part of our paper relates it to the growing literature on relational contracts. Macaulay (1963), Telser (1980) and Klein and Leffler (1981) stressed early that economic transactions are often only episodes of a history of frequent exchanges where informal agreements sustained by future gains from cooperation are crucial. The formal theory of relational contracts was developed by Bull (1987), MacLeod and Malcomson (1989) and Baker, Gibbons and Murphy (1994), and was recently considerably extended by Levin (2003).¹⁰ Relational contracts are typically embedded in a framework of explicit contractual clauses, and the complex interaction between explicit and relational contracts is still being explored.

We know from Baker et al. (1994) and Schmidt and Schnitzer (1995), for example, that effective explicit contracting may hinder relational contracts by improving parties’ fallback position when relationships break down after defections. Baker et al. (1994) show that there are conditions under which the introduction of an explicit contract on a verifiable (but noisy) performance measure may facilitate a relational contract by increasing the overall value of a relationship.¹¹ Klein (2000) argued informally that parties may design explicit contracts with the aim of facilitating relational contracts by limiting the parties’ temptations to defect. This point was formalized by Aghion, Dewatripont and Rey (2002) and by Baker, Gibbons and Murphy (2006) with focus on the effects of the contractual allocation of decision rights on future cooperation.¹² Close to our work are also Bernheim and Whinston (1998), who emphasize that ‘strategic ambiguity’ - limiting the extent of explicit contracting - may be efficient from a relational perspective: choosing not to contractually regulate some *valuable* and contractible tasks may be optimal since more discretion may facilitate punishment and thus cooperation

¹⁰See MacLeod (2007) and Malcomson (2009) for excellent surveys.

¹¹Their model contemplates a contractible and a noncontractible signal of performance on a single task. They show that the highest implicit monetary bonus that can be credibly promised by a principal to an agent may increase when an explicit contract is introduced, but only when the contractible performance measure is too noisy to be useful absent a relational contract. In their framework explicit contracts are always enforced if signed and relational contracts always contemplate bonuses. In contrast, in our model, contracts as threats are signed but not enforced, and discretionary monetary transfers (like bonuses) are a dominated means to sustain a relational contract.

¹²Arguments in this spirit have also been made in the less directly related literature analyzing how asset ownership interacts with relational contracting (see e.g. Baker et al. 2002, Halonen 2002).

on noncontractible tasks. Here we show that the converse may be true; if we take into account the possibility to sign and then ignore explicit contracts, then ‘overcontracting’ may become an effective way to elicit provision on valuable noncontractible tasks.

Finally, the ability of contracts as threats to facilitate cooperation by making utility non-transferable across parties is analogous to the role played by ‘money burning’ in ensuring truthful reporting in recent work on relational contracts with subjective evaluations, like MacLeod (2003), Levine (2003) and Fuchs (2007).¹³

3 Main Ideas

In this section we make many of our points in the simplest possible setting. In the remaining sections we will extend the analysis to a principal-agent model to obtain additional insights on the effects of contracts as threats.

Setup. Consider the game below (game B) where $D_i > C_i > N_i > S_i$. Thus the game is a classic Prisoner’s Dilemma (for the sake of realism one can think of it as a bilateral specific investment problem with incomplete contracts). Since actions are noncontractible, the dominant strategy is to defect (not invest, say).

B	2 Cooperates	2 Defects
1 Cooperates	C_2 C_1	D_2 S_1
1 Defects	S_2 D_1	N_2 N_1

Suppose now that players may agree, before playing B , to sign contracts on some verifiable actions other than those described in game B . In particular, suppose players can contract on some action a_i that cost a_i to player i and produces no benefit for any player (say, digging holes in a desert). Moreover, suppose parties can choose to ignore such contracts if they wish. However, if any of the two players calls for the execution of an explicit contract, the other party must comply with it. Consider the following timing for this extended game.

Timing 1

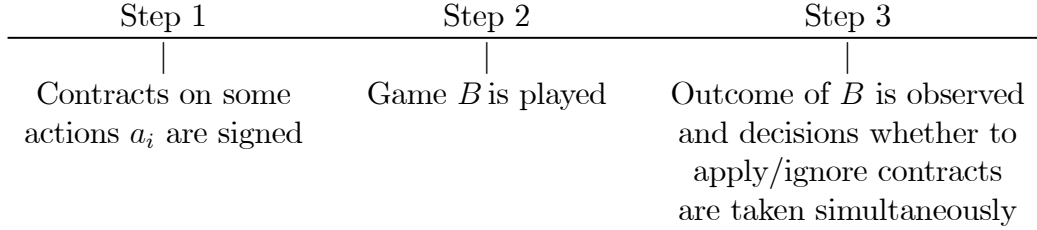
¹³We thank Andy Skrzypacz who let us note this connection.

Step 1: players sign some explicit contracts.

Step 2: game B is played simultaneously: players choose whether to cooperate

Step 3: players observe the outcome of game B and simultaneously choose whether to call for the application of any of the explicit contracts signed in step 1.

Graphically, the time line of this sequential game is therefore:



Benchmark. Suppose that signed contracts cannot be renegotiated and consider the following strategy profile described for player i .

Strategies 1

In Step 1, sign two contracts prescribing $a_i > D_i - C_i$ for each player i .

In Step 2, choose to cooperate.

In Step 3, if player j cooperated in Step 2, ignore both explicit contracts. If player j defected, call for the application of the explicit contract prescribing a_j and ignore the one prescribing a_i .

By backward induction, it is easy to verify that bilateral cooperation is now a subgame perfect Nash equilibrium (although a ‘weak’ one because supported by player i ’s indifference on the application of the explicit contract prescribing a_j).¹⁴ If a party defects whilst the other cooperates, he will now obtain $D_i - a_i$ which by construction is lower than C_i , the payoff from cooperation. By writing an explicit contract on some verifiable task that has no value but is costly to undertake, and by choosing not to

¹⁴The fact that in the last stage players are indifferent is not a major problem as we know that real players tend to prefer punishing if they have been cheated upon even when it is costly (Fehr and Gächter, 2000).

call for its application unless the other party deviates, the parties can sustain bilateral cooperation even in a one-shot game.¹⁵

RESULT 1. *Without renegotiation, writing and ignoring explicit contracts on independent actions that are valueless but costly to undertake allows to implement the cooperative outcome in a static setting as a Subgame Perfect Nash Equilibrium.*

The explicit contract is used to construct a future credible punishment, ignored if a player cooperates, executed if he does not. It is of course crucial that implementing the explicit contract is not profitable for the party using it as a threat, as otherwise this party would always find it optimal ex post to call for its implementation, even after the opponent cooperated. This explains why in the game above a_i must be valueless.

Stipulated damages and non-transferable utility. Until now we have considered forcing contracts, so that the explicit contract has to be implemented if one party calls for its application. Suppose now that parties agree on some stipulated damages F_i for contract violation: if a party i does not comply with a contract requiring action a_i , the other party is entitled to compensation F_i . Let μF_i denote the net benefit for party j from receiving F_i , where $\mu \in [0, 1]$. After the enforcement of the explicit contract is called for, the party can choose between complying or paying F_i . Then the timing would be as follows.

Timing 2

Step 1: players sign some explicit contracts specifying a_i and F_i .

Step 2: actions are chosen. Players simultaneously choose whether to cooperate or defect in game B and whether to undertake contracted actions a_i .

Step 3: players observe the outcome of game B and simultaneously choose whether to levy the fine F_i if the action a_i was not undertaken.

In this static framework, the presence of stipulated damages ($\mu F_i > 0$) creates an incentives for parties to call for the application of the explicit contracts in the last stage

¹⁵And given that there are gains from trade, there will be ex-ante transfers ensuring that parties will sign such contracts.

of the game regardless of previous history. This pecuniary incentive destroys the value of contracts as threats not because they are not credibly implemented as a punishment, as in the case of costless and instantaneous renegotiation, but because they are always implemented, independently of the occurrence of a defection in game B.

RESULT 2 *With stipulated damages $\mu F_i > 0$, contracts as threats are worthless in static settings.*

It follows from Result 2 that in static settings when parties want to use contracts as threats and forcing contracts are not feasible, they will choose $\mu = 0$, for example by introducing a third party as the recipient of the fine (as is often the case in public procurement, though mainly for accountability reasons). This highlights the importance of non-transferable utilities. For contracts as threats to be effective, contracts must be written that are costly to one party but bring no benefit to the other party.

Costly contract enforcement. In reality calling for the execution of explicit contracts entails some costs, very large costs in some countries, the cost of having an explicit contract implemented by the law enforcement system.¹⁶ When contract enforcement is costly, in a standard set up (in the sense that only own material payoffs matter to players) a contract on a literally valueless action would not constitute a credible threat, as it would be always optimal to ignore the contract ex post to save on contract enforcement costs.

Denote by $e > 0$ the contract enforcement cost. Let parties choose an action a_i that costs a_i to party i and has value $\nu_j(a_i) < a_i$ to party j , with penalty for noncompliance $F_i \geq a_i$ and such that $\mu F_i = \nu_j(a_i) = e$. $\nu_j(a_i) < a_i$ ensures that the contract in itself is still inefficient. $\mu F_i, \nu_j(a_i) = e$ ensures that party j can again credibly threaten to call for the application of the explicit contract prescribing action a_i if i deviates on B , and can credibly promise to ignore the contract if i cooperates. With $\mu F_i = \nu_j(a_i) > e$ instead party j would always call for the application of the contract, whilst with $\mu F_i, \nu_j(a_i) < e$ he would never and the threat would be empty). Thus, we have the following.

¹⁶Djankov et al. (2003) empirically document how slow and costly contract enforcement can be even for simple contracts and in highly developed legal systems. See also <http://www.doingbusiness.org/ExploreTopics/EnforcingContracts/>

RESULT 3: *With positive contract enforcement costs, inefficient explicit contracts on contractible tasks with the same value as enforcement costs ($\mu F_i = \nu_j(a_i) = e$) can be used as credible threats to elicit effort on more valuable noncontractible tasks. Contractible tasks used as threats will therefore be more valuable the larger are contract enforcement costs.*

Result 3 suggests that in real world situations, in which contract enforcement costs are positive, we should expect inefficient contracts to prescribe (low but) positive value tasks to be used as effective threats to implement more valuable noncontractible tasks.

It is also worth noting that in some legal environments courts may not be willing or able to enforce a contract that is literally valueless for one party (although realizing or establishing this may be difficult). In principle, this could make contracts as threats ineffective in the absence of enforcement costs. The presence of significant enforcement costs in reality removes this potential problem, as then negative-gains-from-trade contracts on tasks delivering positive utility to the threatening party can be used as threats to obtain more valuable noncontractible tasks.

Remark 1 *To simplify exposition and without loss of generality in the remainder of the paper we will normalize by setting $e = 0$. All the results will however apply to the real world case of $e > 0$, so the term 'valueless task' should be interpreted as 'low value task that makes the threatening party indifferent' between facing the costs of contract enforcement and save them by ignoring the contract.*

Contract renegotiation. Until now we implicitly assumed away contract renegotiation to capture the many situations in which explicit contracts cannot be renegotiated at reasonable speed or cost. The example of work-to-rule is an obvious case. It is simply unconceivable that a collective labor contract involving unions and tenth of thousands of workers could be amended or renegotiated at no cost to prevent a work-to-rule strike in a plant. Similarly, in public procurement contract renegotiation is often forbidden, strictly limited, or very costly.¹⁷

¹⁷Even when contract renegotiation is feasible at low cost, it may need time, so parties could ensure that the explicit contracts are credible threats by establishing that the validity of the contracts expires if they are not enforced within a time span shorter than that needed to renegotiate them.

However, there are also many other situations where renegotiation is possible at low cost and without too much delay. To take these situations into account, let us suppose now that signed contracts can be renegotiated instantaneously, and let z denote the renegotiation cost. Since implementing the explicit contract is ex-post inefficient, the parties will renegotiate as long as the gain from renegotiation is larger than z , that is if $z \leq a_i$.

Consider the case where the same two contracts can be renegotiated. For simplicity and without loss of generality suppose that only one contract can be renegotiated at the time. Assuming 50:50 Nash bargaining the parties will obtain respectively

$$R = \left\{ -a_i + \frac{1}{2}(a_i - z); \frac{1}{2}(a_i - z) \right\},$$

where $-a_i$ is the default payoff of party i . Contracts as threats are then still effective as long as the following two conditions hold. First, the gain for a party from deviating in game B is weakly smaller than the cost of contract application, taking into account the renegotiation. That is

$$C_i \geq D_i - a_i + \frac{1}{2}(a_i - z).$$

Secondly, when a party cooperates, the gain for the other party from calling for the contract application and then renegotiating the contract is non-positive

$$\frac{1}{2}(a_i - z) \leq 0.$$

Putting these two conditions together we obtain.

RESULT 4. *When renegotiation is possible, contracts as threats remain effective as long as gains from defections are smaller than renegotiation costs, $z \geq D_i - C_i$.*

The more costly (or slow) contract renegotiation, the more valuable the use of contracts as threats. When contract renegotiation is possible, so that contractual obligations can be reciprocally waived by the parties, then only with positive renegotiation cost contracts as threats bite.

Repeated play and relational contracts. We have shown that bilateral cooperation can be sustained in one-shot games by using contracts as threats. We now

show that contracts as threats may be even more effective when the game is repeated. Suppose that the stage game described above (Timing 2) is frequently and infinitively repeated, and that $\mu F_i > 0$, for example because the legal environment limits parties's ability to write forcing contracts. Suppose also that contracting takes time, so that - as in all models of relational contracting - explicit contracts can be signed and renegotiated at cost z at the beginning or the end of the period, but not within a period.¹⁸

Consider the following strategies for player i .

Strategies 2

"Start signing two separate long-term contracts each prescribing action $a_i > D_i - C_i$ for player i in each period and stipulated damages $F_i = a_i$.

In the cooperative phase, choose to cooperate and ignore the explicit contracts as long as everybody cooperates.

In the punishment phase, if player j defects, call for the application of the explicit contract prescribing a_j and stop cooperating forever after."

Total gains from renegotiation are then

$$\frac{\delta (a_i + a_j)}{1 - \delta} - 2\delta z,$$

where δ is the common intertemporal discount factor. Cooperation is then sustainable if the punishment is sufficiently harsh to deter all defections. Player i will not defect if

$$\frac{C_i}{1 - \delta} \geq D_i - a_i + \mu F_j + \frac{\delta (N_i + \frac{-a_i + a_j}{2})}{1 - \delta} - \delta z.$$

Inspecting this constraint leads to the next result.

RESULT 5. *With repeated interaction, when contract renegotiation can only occur at the beginning (end) of each period, contracts as threats are valuable even when forcing*

¹⁸Allowing also renegotiation of strategies would complicate the set up without adding any insight. In our set up renegotiation-proofness of the punishment strategies regarding future play of game B can be achieved designing the punishment phase as in van Damme (1989). Moreover, since there are monetary transfers even Pareto perfection can be achieved (the strongest form of renegotiation-proofness) through strategies that are equivalent to those we analyze. After a deviation, the deviating party pays a transfer to the damaged party at the end of the period when the deviation occurred or at the beginning of the next, followed by return to cooperation (see Levine 2003, Corollary 1).

contracts are not possible and $\mu F_i > 0$ or $z < D_i - C_i$. In particular, contracts as threats facilitate cooperation as long as $\mu < 1$, or $z > 0$.

When the game is repeated, contracts may have two effects. The first one is to generate sequentiality within the stage game, the effect described in Results 1 and 2. The second one is to strengthen the future punishment phase supporting cooperation in the repeated game. The first effect arises even when forcing contracts are not possible; it holds as long as $\mu < 1$ but it disappears when $\mu = 1$. The second effect remains as long as $z > 0$. It only disappears when $z = 0$, as in this case, contractual obligations can be reciprocally waived by the parties at no cost. As for other inefficient contractual devices delivering strategic advantages, like strategic delegation contracts, the possibility of renegotiating at low costs tends to undermine the benefit of the arrangement (Dewatripont 1988). For example, in Halonen (2002) the positive effect of joint ownership is smaller the lower are renegotiation costs, and the effect vanishes all together when the renegotiation cost is zero.

Dysfunctional tasks. We have focused on tasks that are costly to perform for one party but produce little or no value for the other. However, our results equally apply to the case where the parties use as threats contractual clauses prescribing tasks that impose little cost on the performing party (e.g. prescribe to follow a particular procedure rather than others) but that damage considerably the other party (e.g. slowing down production). In fact, we can reinterpret the cost of action a_i as a damage suffered by party i when j executes a task (or executes a given task in a particular way), prescribed in the contract, that is costless for j to perform but is dysfunctional in the sense that it damages i (think at the impractical contractual procedures exploited by work-to-rule practices).

Remark 2 *A reinterpretation of our analysis implies that contracts as threats can be equally effective if they prescribe costless but dysfunctional tasks. In this interpretation the verifiable action a_i is costless to perform for party j and creates a loss $-a_i$ to party i .*

4 A Repeated Principal-Agent Model

We now consider a stylized repeated principal-agent model to discuss other aspects of real world relationships where contracts as threats may play an important role.

4.1 Basic Setup

Consider a long term (infinite horizon), bilateral, repeated interaction between a principal and an agent. Time is discrete and both parties discount future payoffs through a common and strictly positive factor $\delta < 1$. Let $c_J(j)$ denote the agent's increasing and convex cost function of providing a certain level j of effort in task (or good, service, investment of type) $J = A, B, C, \dots$, and let $v_J(j)$ denote the weakly concave increasing value accruing to the principal when receiving intensity j of task J from the agent. Both the principal and the agent are risk neutral and receive zero if they choose not to trade.¹⁹

The relationship between the principal and the agent can be characterized by some verifiable ingredients, e.g. the terms of an explicit contract on a verifiable task, say task A and by non-verifiable ingredients on a non-verifiable task, say task B . The explicit contract on A prescribes task intensity a , a per-period price p_A , and fines F^A and F^P for the agent's and for the principal's non-performance, respectively. The implicit contract prescribes task intensity b and a per-period discretionary transfer t_B .

We start by assuming that the principal and the agent can commit to a long-term contract (or that, equivalently, renegotiation cost is very high). We relax this assumption in Section 4.5 where we study the effect of renegotiation and short-term contracting. For the sake of crispness we will continue neglecting contract enforcement costs, though all results apply to the realistic case of positive enforcement costs (according to Result 3).²⁰

The timing of the game between the principal and the agent can be either simultaneous or sequential. In case of sequential timing, without loss of generality (the inverse

¹⁹Linearity in income is a convenient simplification and, with no uncertainty in the model, the degree of risk aversion plays no role.

²⁰We should therefore continue to interpret the statement that "a task is valueless to a party" to mean that "the expected value of calling for the enforcement of the contract is zero for that party" because the positive enforcement costs erode the positive value of the contracted task.

timing leads to the same qualitative results), we assume that the principal moves first; any implicit transfer is then paid before the agent choose his actions.

TIMING(S)

period 0: *The principal and the agent may sign an explicit contract and/or agree on an implicit/relational contract.*

period 1: *An infinite repetition of (one of) the following stage game(s) takes place:*

STAGE GAME 1 (simultaneous actions)

Step 1: *The principal and the agent simultaneously choose verifiable and non-verifiable actions.*

Step 2: *The principal and the agent observes each other's Step 1 choices and, if violations of an explicit contract took place, they choose whether or not to impose fines (F^α , F^P).*

STAGE GAME 2 (sequential actions)

Step 1: *The principal pays any explicitly contracted or implicitly agreed upon transfer and chooses any other contractible or noncontractible action.*

Step 2: *The agent observes the choices of the principal in Step 1 and then chooses his own verifiable and non-verifiable actions, including whether or not to impose the fine F^P if the principal violated an explicit contract.*

Step 3: *The principal observes the agent's choices in Step 2, if the agent violated an explicit contract, chooses whether or not to impose the fine F^α .*

4.2 Benchmark: Standard Relational Contracting

Relational contracting can help motivating the agent to undertake the non-verifiable task B . The principal and the agent can informally agree that in each period the agent

undertakes task B at level b and the principal operates a discretionary transfer t_B , with per-period payoffs $\{t_B - c_B(b), v_B(b) - t_B\}$. Suppose the parties use grim strategies to sustain the agreement: if the agent deviates, the principal will withhold payment forever in the future and the agent will not cooperate; if the principal deviates, the agent will never exert effort again in the future and the principal will withhold payments. We refer to this type of relational contracting, based on the use of discretionary transfers, as "standard relational contracting" (ST).

Consider first the case of simultaneous actions, i.e. STAGE GAME 1. The principal and the agent will accept to participate to the contract if their respective expected payoff is non-negative, which gives the following participation constraints

$$IR^{ST} - P : V \equiv \frac{v_B(b) - t_B}{1 - \delta} \geq 0 \quad (1)$$

and

$$IR^{ST} - \alpha : U \equiv \frac{t_B - c_B(b)}{1 - \delta} \geq 0. \quad (2)$$

Consider now the incentive of the principal to pay the informal transfer t_B in the current period. By withholding the payment, the principal saves t_B in the current period but foregoes the surplus $\frac{\delta(v_B(b) - t_B)}{1 - \delta}$ in all subsequent periods. His relational incentive constraint is then given by

$$RIC^{ST} - P : V \equiv \frac{v_B(b) - t_B}{1 - \delta} \geq v_B(b). \quad (3)$$

The agent will undertake task B at intensity b in the current period if enjoying the surplus $t_B - c_B(b)$ in all future periods is better than saving $c_B(b)$ in the current period. Thus, the agent's relational incentive constraint is

$$RIC^{ST} - \alpha : U \equiv \frac{t_B - c_B(b)}{1 - \delta} \geq t_B. \quad (4)$$

When instead the timing of the exchange is sequential as in STAGE GAME 2, there are no gains from defection for the principal: as the principal moves first, deviating by not paying the transfer t_B is not profitable as the agent will not deliver b . This implies that the only relevant relational incentive constraint is (RIC- α).

The following Lemma is then obtained.

Lemma 1 (*Standard Relational Contracting*) *With demand for a single non-verifiable task and no explicit contracting on other tasks, the set of relational contracts sustaining positive levels of the noncontractible task in equilibrium are: (i) $\Phi_{Sml}^{ST}(b, \delta)$ when actions are simultaneous, characterized by the condition*

$$\delta^2 v_B(b) - c_B(b) \geq 0; \quad (5)$$

and (ii) $\Phi_{Seq}^{ST}(b, \delta)$ when actions are sequential, characterized by the condition

$$\delta v_B(b) - c_B(b) \geq 0; \quad (6)$$

where, from (5), $\Phi_{Seq}^{ST}(b) \supseteq \Phi_{Sml}^{ST}(b)$.

Proof: see the Appendix.

Through the use of discretionary transfers t_B , relational contracting can help motivating the agent when explicit contracting is not possible. For any given δ , some positive level of task intensity b can be sustained through standard relational contracting, and for δ sufficiently high the first best intensity b_{FB} is sustainable. For δ binding, the set of effort level sustainable with sequential actions is strictly larger than with simultaneous actions, as it happens in a repeated Trust Game if compared to a payoff-equivalent repeated simultaneous actions Prisoner's Dilemma game.²¹

4.3 The General Value of Contracts as Threats: (over)contracting on A to Obtain B

Assuming for the moment that renegotiation is prohibitively costly. Suppose that the parties write a long term explicit contract $\Phi = \{a, p_A, F^\alpha, F^P\}$ on a verifiable task A valueless to the principal. The principal then uses this contract to motivate the agent to provide the valuable but noncontractible task B . The transfer in this 'indirect' relational contract is p_A , which compensates the agent for his provision of costly $b > 0$.

²¹In the sequential game we have assumed that first the principal pays t_B and then the agent chooses task intensity. As the only possible deviation is from the agent, giving all the surplus to the agent by setting $t_B = v_B(b)$ maximized cooperation. If we invert the sequence of moves and assume that first the agent chooses verifiable and non-verifiable actions and then the principal pays any explicitly and implicitly contracted transfers, then the relevant constraint becomes (RIC-P). The set of sustainable actions remains the same and it is now found by setting $t_B = c_B(b)$ and thus giving all the surplus to the principal.

The principal and the agent also implicitly agree on a relational contract prescribing $a = 0$ and $b > 0$ on the equilibrium path, sustained by the threat of enforcing the explicit contract in case a defection is observed. Thus, the principal's grim trigger strategy is: if the agent deviates in the current period by not undertaking B , the principal will implement the contract and demand task intensity a on task A forever after, imposing fines F^α whenever that task is not delivered. The agent's grim strategy is: if the principal deviates in the current period by not paying t_B , the agent will not exert b ever again in the future. In the punishment phase, the explicit contract is enforced: the principal will (have to) pay p_A to the agent or incur fine F^P and the agent will exert a or incur fine F^α . With regard to the timing of the discretionary payment t_B we focus on the simultaneous case (Stage game 1).

In this case the participation constraints of the principal and the agent are respectively given by

$$\begin{aligned} IR^{OV} - P & : \frac{v_B(b) - p_A - t_B}{1 - \delta} \geq 0, \\ IR^{OV} - \alpha & : \frac{t_B + p_A - c_B(b)}{1 - \delta} \geq 0. \end{aligned}$$

Suppose that $t_B \geq 0$: the discretionary transfer takes the form of a payment from the principal to the agent. A deviation by the principal then consists in not paying t_B when b was observed and in levying the fine F^α on the agent for not exerting a .²² After such a defection, the principal will have to pay p_A forever after (optimal if $F^P \geq p_A$), in exchange for the valueless a , or otherwise pay the fine F^P (optimal if $F^P < p_A$). Therefore, the relational incentive constraints of the principal is

$$RIC^{OV} - P : \frac{v_B(b) - p_A - t_B}{1 - \delta} \geq v_B(b) - \min [p_A, F^P] + \mu F^\alpha - \frac{\delta \min [p_A, F^P]}{1 - \delta}. \quad (7)$$

Conversely, the agent can profitably defect from the relational contract by not providing b , but then he will have to simultaneously provide a (optimal if $F^\alpha \geq c_A(a)$) or pay the fine F^α (optimal if $F^\alpha < c_A(a)$). Therefore, the relational incentive constraints of the agent is

$$RIC^{OV} - \alpha : \frac{t_B + p_A - c_B(b)}{1 - \delta} \geq t_B + p_A - \min [F^\alpha, c_A(a)] + \delta \frac{p_A - \min [F^\alpha, c_A(a)]}{1 - \delta}. \quad (8)$$

We then obtain the following Lemma:

²²Deviating by not paying the transfer $p_A(a_E)$ at the beginning is not profitable, as then the agent will not perform and will exercise the penalty F^P .

Proposition 1 (Optimality of Low Fines). *The set of sustainable relational contracts with explicit overcontracting is non-empty and it is maximized by setting the fines at the minimum level necessary to induce compliance with the explicit contract, i.e. $F^\alpha = c_A(a)$ and $F^P = p_A$.*

Proof: see the Appendix.

Lemma 1 provides a novel rationale for fines to be bounded above. The value of fines is to induce the parties to comply with the explicit contract in the punishment phase. There is no need for the fines to penalize the parties by imposing a cost that goes beyond the cost of compliance, because non-compliance is perfectly detectable and there is nothing that fines can do which could not be done within the contract. Setting the fines higher than the cost of compliance for a party would reduce the feasibility of relational contracting by giving incentives to the other party to defect from the relational contract to cash the fine.

In the light of Lemma 1, the two relational constraints reduce to

$$R\tilde{I}C^{OV} - P : \frac{\delta v_B(b) - t_B}{1 - \delta} \geq \mu c_A(a),$$

and

$$R\tilde{I}C^{OV} - \alpha : c_A(a) \geq c_B(b) - \delta t_B.$$

By cooperating, the principal gains the surplus $v_B(b)$ from the valuable task in all future periods and gives up the gain $\mu F^\alpha = \mu c_A(a)$ from levying the fine in the current period. By cooperating in the current period, the agent incurs the cost $c_B(b)$ in the current and in future periods but it secures t_B in all future periods, whilst it saves on the cost $c_A(a)$ of undertaking the explicitly contracted task A , in the current and in future periods. These relational constraints are independent of p_A since p_A must be paid regardless of whether b is performed.

Summing up the two constraints, we obtain

$$RIC^{OV} : \delta v_B(b) - c_B(b) - (1 - \delta) t_B + c_A(a) (1 - \mu (1 - \delta)) \geq 0 \quad (9)$$

Since the left hand side of this constraint decreases with t_B and is not affected by p_A , the set of sustainable relational contracts is maximized at $t_B = 0$ with p_A chosen so as to satisfy IR^{OV} . This leads us to the following Lemma.

Lemma 2 (*Sub-optimality of Discretionary Transfers*). *With overcontracting, discretionary transfers are suboptimal: in any relational efficient equilibrium $t_B = 0$.*

Proof: see the Appendix.

Monetary transfers are transferable, they can discipline one party but only at the cost of increasing the temptation to defect of the other. Instead, overcontracting makes utilities non-transferable, disciplining one party without increasing the temptation to defect of the other. By creating an ‘inefficient threat’, overcontracting is related to the positive effect of ‘money burning’ in relational contracting models with subjective evaluation, like McLeod (2003), Levine (2003), and Fuchs (2007).

Proposition 2 (*Rewarding A to Obtain B*) (i) *Explicit (over-)contracting on a valueless but verifiable task allows to sustain higher levels of the valuable non-verifiable task than standard relational contracting under either sequential or simultaneous timing. In particular, the set of sustainable relational contracts $\Phi^{OV}(b, \delta)$ is characterized by the condition*

$$\delta v_B(b) - c_B(a)\mu(1 - \delta) \geq 0, \quad (10)$$

with

$$\Phi^{OV}(b, \delta) \supset \Phi_{Seq}^{ST}(b, \delta) \supset \Phi_{Sml}^{ST}(b, \delta).$$

Proof: see the Appendix.

Compared to standard relational contracting, overcontracting generates two effects. First, it introduces the agent’s obligation to comply with the *explicit* contract (or pay the fine) and it gives the principal the ability to levy the fine after observing whether the agent complied with the *implicit* agreement. By allowing the principal to react immediately to a deviation by the agent, overcontracting generates a sequentiality that facilitate cooperation (strictly so when the stage game is simultaneous). In particular, by choosing intensity of task A such that $c_A(a) = c_B(b)$, the agent is made indifferent between complying with the implicit contract, exerting b , and deviating, exerting a (or pay the fine $F^\alpha = c_A(a)$). Other things equal, overcontracting can therefore do at least as well as standard relational contracting with sequential timing where the agent moves first and only the principal’s incentive constraint matters. When $\mu = 0$, overcontracting also completely removes the incentives of the principal to defect as he obtains no benefit from levying the fine F^α . The incentive to defect of the principal

increases with μ , indicating that forcing contracts, were feasible, maximize the benefit of overcontracting.

Second, by requiring parties to comply with an inefficient explicit contract, overcontracting strengthens the punishment phase starting the period after a defection takes place. This effect explains why overcontracting can do also strictly better than standard relational contracting with sequential timing.

The second effect (strengthening punishment phase) is reminding of the positive effect of inefficient ownership structures on investment in long term relationships with 'hold up' problems (see e.g. Halonen 2002).

We have so far assumed that the verifiable task A , contracted upon to induce effort on task B , is valueless to the principal. The Proposition below confirms that when explicit contracts are only used as threats (and enforcement costs are zero), it is indeed optimal in this dynamic framework to write the contract on tasks that are valueless to the principal. This helps to reduce his incentive to deviate by enforcing the explicit contract also when the agent cooperated.

Proposition 3 *The set of sustainable task intensities for the noncontractible task B that is achievable through overcontracting on a verifiable task A is maximized when A is valueless to the principal.*

Proof: see the Appendix.

4.4 Contracts as Threats and Bureaucratic Control

Explicit contracts that are not applied in equilibrium have additional value when the principal is a manager of a large organization subject to regulatory or governance rules. These rules often do not allow to operate discretionary payments t_B that are not part of an explicit contract, say because it would be too hard to prevent dishonest agents present in the population to unduly appropriate part of the transfer. Let us name this common practice 'Bureaucratic Control' (BC), and define it by two assumptions very close to many real world situations.

BC1. With BC, it is forbidden for the principal to operate 'discretionary transfers',

i.e. transfers that are not justified by an explicit contract detailing what was that transfer paid for, and it is forbidden to renegotiate publicly awarded explicit contracts.

BC2. Monitoring coincidence between payments and explicit contracts in the books is easy and cheap (e.g. through book audits) and it is always done; monitoring contract implementation, i.e. verifying whether the goods or services explicitly contracted upon have been effectively delivered at the quality levels the contract prescribed, is costly/difficult and it is never done.

These assumptions bring to the limit, for the sake of crispness, the rather obvious observation that checking whether the books are correct, i.e. that to each payment corresponds an explicit contract, is much cheaper and is done much more often than checking whether the explicit contracts have then been effectively managed/applied ex post.

Suppose now that the principal is subject to BC. Standard relational contracting becomes impossible because the principal cannot reward the agent for his effort. However, parties under BC can circumvent the reduction of discretion through overcontracting.

Proposition 4 (*Bureaucratic Control*). *With the principal subject to BC, $t_B = 0$ and standard relational contracts on task B are unfeasible: $\Phi_{Seq}^{BC} = \Phi_{Sml}^{BC} = \emptyset$. Explicit (over-)contracting on a valueless but verifiable task A allows to compensate the agent and sustain otherwise unfeasible relational contracts. The implementable task intensities satisfy the condition*

$$\delta v_B(b) - c_B(a)\mu(1 - \delta) \geq 0,$$

as in Proposition 2.

The proof is obvious and it is omitted.

When the principals are members of a large hierarchical organizations, like civil servants procuring for a government or procurement managers of large firms, overcontracting can be the only mean to sustain relational contracting as discretionary transfers are not allowed.

Of course, this 'efficient' interpretation relies on our choice to focus on 'benevolent' employees or civil servants. As mentioned in introduction, exactly the same strategies could be used by non-benevolent employees to enforce implicit corrupt deals trading contract non-enforcements against bribes or private benefits.

4.5 Renegotiation and Short Term Contracts

In the basic principal-agent model we have assumed that the parties can commit to long-term explicit contracts. We now consider the possibility that explicit contracts can be renegotiated at low cost, and in particular after a defection from a relational contract is observed. Clearly, this possibility has no effect under standard relational contracting, as no explicit contract is present. Consider therefore the case of overcontracting on a to sustain otherwise unfeasible levels of b . We will discuss both long and short-term contracts. For simplicity we let $\mu = 1$.

Suppose, as in most previous work on relational contracts that contract renegotiation or the negotiation of new short term contract can take place at the end (or beginning) of each stage game. Then an additional (re-)contracting step should be added to the timings described at the beginning of this section, so that the stage game of the repeated game is as follows:

Stage Game with Renegotiation	
$t = 0$	$t = 1$
Long-term contracts on actions a_i are signed or renegotiated	STAGE GAME 1 or STAGE GAME 2 is played

After a deviation is observed, at the renegotiation stage opening the following period the principal and the agent will bargain to share the gain from not implementing the inefficient explicit contract in the future, net of the renegotiation cost z : $\frac{\delta c_A(a)}{1-\delta} - z$. When $z \geq \frac{\delta c_A(a)}{1-\delta}$ at $c_A(a) = c_B(b)$, we are in the situation of Section 4.3, so we focus here on $z < \frac{\delta c_A(a)}{1-\delta}$. Assuming $0 \leq z < \frac{\delta c_A(a)}{1-\delta}$ and 50:50 Nash bargaining in the

renegotiation phase, the agent obtains

$$\frac{\delta(p_A - c_A)}{1 - \delta} + \frac{1}{2} \left(\frac{\delta c_A}{1 - \delta} - z \right) = \frac{\delta(p_A - \frac{1}{2}c_A)}{1 - \delta} - \frac{z}{2},$$

whilst the principal obtains

$$\frac{-\delta p_A}{1 - \delta} + \frac{1}{2} \left(\frac{\delta c_A}{1 - \delta} - z \right) = -\frac{\delta(p_A - \frac{1}{2}c_A)}{1 - \delta} - \frac{z}{2}.$$

We then obtain the following Proposition.

Proposition 5 (*Overcontracting with Renegotiation*). *Renegotiation reduces the set of relational contracts sustainable with overcontracting to $\hat{\Phi}^{OV}(b, \delta, z)$, characterized by*

$$\begin{aligned} \delta v_B(b) - c_B(a)(1 - \delta) \geq 0 & \quad \left\{ \begin{array}{l} \text{if } \frac{\delta c_B(b^{OV})}{1 - \delta} < z \\ \delta v_B(b) - c_B(b) + (1 - \delta)z \geq 0 \end{array} \right. \\ \delta v_B(b) - c_B(b) + (1 - \delta)z \geq 0 & \quad \left\{ \begin{array}{l} \text{if } \frac{\delta c_B(b^{OV})}{1 - \delta} \geq z \end{array} \right. \end{aligned}, \quad (11)$$

increasing in z and such that $\tilde{\Phi}^{OV}(b, \delta, z) \subseteq \Phi^{OV}(b, \delta)$. However: (i) As long as $z \neq 0$, overcontracting allows to sustain higher levels of noncontractible task intensities b than standard relational contracting: $\tilde{\Phi}^{OV}(b, \delta, z) \supset \Phi_{Seq}^{ST}(b, \delta) \supset \Phi_{Sml}^{ST}(b, \delta)$. (ii) At $z = 0$, overcontracting weakly dominates standard relational contracting, and strictly dominates it when the timing of the stage game is simultaneous or if there is BC.

Proof: see the Appendix.

By increasing the payoffs of the parties in the punishment phase, renegotiation reduces the sustainability of relational contracts with overcontracting. As payoffs raise more the lower is the renegotiation cost, the set $\hat{\Phi}^{OV}(b, \delta, z)$ of sustainable relational contracts shrinks as z decreases.

However, in our setup even in the degenerate case of $z = 0$ renegotiation does not completely eliminate the value of overcontracting. This is because of the first effect of overcontracting described above, namely the ability of overcontracting to create sequentiality when the original stage game is simultaneous. Indeed, by inspection, at $z = 0$, $\tilde{\Phi}^{OV}(z = 0, b) = \Phi_{Seq}^{ST}(z = 0, b)$ in (6). The following Proposition is then obtained.

In our simple framework we also obtain this result when only one-period explicit contracts are available and renegotiation can occur only at the beginning/end of the game.

Corollary 1 *The set of sustainable relational contracts with overcontracting when only short term contracts are feasible is the same as that with long-term overcontracting and costless renegotiation ($z = 0$). Hence, also when only short-term contracts exist, overcontracting allows to sustain weakly higher levels of task b than standard relational contracting, and strictly higher ones when the timing of the stage game must be simultaneous or if there is BC .*

Proof: see the Appendix.

4.6 Distributional Effects and Financing Constraints

In this section we make the extreme assumption that renegotiation is costless (or that only one-period explicit contracts can be signed), and show that even with sequential timing there might still be reasons for using overcontracting to sustain relational contracts.

Distributional effects. In standard relational contracting, an agent who gets no surplus gets no long-term benefit from continuing the contract, and will therefore deviate if the timing of the exchange cannot be properly adjusted by making the agent move first. Indeed, under standard relational contracting, $t_B \geq c_B(b)/\delta$ is necessary for $(\text{RIC}^{\text{ST}}-\alpha)$ to be satisfied: the agent must be given a rent of at least $(1 - \delta)c_B/\delta$. Under overcontracting, instead, an agent who gets no surplus can still get a long-term benefit from continuing the contract because there is a cost of deviating. In the case of no renegotiation, for example, when the agent deviates he triggers the implementation of the explicit contract, which costs him $c_A(a)$. Since deviating saves the agent the amount $c_B(b)$, choosing a such that $c_A(a) = c_B(b)$ suffices to remove any incentive to deviate. We then obtain:

Corollary 2 *Even if $z = 0$ or only short term contracts are available, if the timing of the exchange follows STAGE GAME 1 or 2 overcontracting on A allows the principal to implement any level of B that is feasible under standard relational contracting whilst retaining a greater share of the surplus. With overcontracting, no rent is needed to discipline the agent.*

Proof: see the Appendix.

Financing constraints. This same ability of overcontracting to solve problems linked to the sequence of exchange has also important effects when there are financial constraints. Suppose, for example, that the principal has all bargaining power and therefore is the residual claimant of the future rent from the relationship. Suppose further that the task is a nonverifiable but costly investment, and that the agent does not have his own money to finance such an investment and is financially constrained (cannot borrow it). Since the principal has the bargaining power, we know that it would be efficient that he required the agent to invest first, thus reversing the sequence of moves in STAGE GAME 2. However, if the agent is financially constrained, he will not be able to invest first and an inefficient timing will have to be chosen that will also cost the principal part of the obtainable rent, as shown by the Corollary above.

Overcontracting on a useless but verifiable task, even if $z = 0$ or only short term contracts are available, allows to solve the problem thanks to its distributional effects. It allows the principal to pay first p_A to the agent, which allows the agent to finance the agreed upon investment b , without inducing any inefficiency and rent redistribution. We thus have:

Corollary 3 *Even if $z = 0$ or only short term contracts are available, overcontracting allows to sustain efficient relational contracts when financing constraints would not allow it otherwise.*

5 Conclusions

We have shown that explicit contracts can not only be seen as safe "boundaries" within which relational contracts operate better, as suggested by Klein (2000), or as constraints on discretion that hinder relational contracting, as suggested by Bernheim and Whinston (1998), but also as credible "threats" that are not applied on the equilibrium path but actively help governing relationships. Within the limits imposed by renegotiation costs, we found that overcontracting dominates any other form of relational contracts. Our results explain why contracts often include clauses rewarding apparently useless tasks; why these are often not applied; and why it is optimal to limit penalties for infringements.

As mentioned earlier, we have mainly focused on legal and productive noncon-

tractible tasks B (effort or investments). However, overcontracting could also be used to govern exchange of illegal tasks, such as bribes. The trade off between the positive and negative effects of overcontracting and the optimal regulatory response to it in different legal and cultural environments appears an important question to address in future work. Based on externalities between contractible and noncontractible tasks, our results also open the way to many new questions on optimal job and organizational design. Moreover, as contracting is often costly, future work should explore the role of contracts as threats and the interaction between explicit and implicit contracting when writing explicit contracts is costly.

6 The Appendix

Proof of Lemma 1. (i) With standard relational contracting and simultaneous timing, the set of feasible relational contracts maximizes b subject to $(\text{IR}^{\text{ST}}\text{-P})$, $(\text{IR}^{\text{ST}}\text{-}\alpha)$, $(\text{RIC}^{\text{ST}}\text{-P})$ and $(\text{RIC}^{\text{ST}}\text{-}\alpha)$. When $(\text{RIC}^{\text{ST}}\text{-P})$ and $(\text{RIC}^{\text{ST}}\text{-}\alpha)$ are satisfied, $(\text{IR}^{\text{ST}}\text{-P})$ and $(\text{IR}^{\text{ST}}\text{-}\alpha)$ are also satisfied, thus we can ignore the latter two constraint. Now let $b^{\text{ST}}(\delta)$ denote the highest sustainable b under standard relational contracting. We show that at b^{ST} , both $(\text{RIC}^{\text{ST}}\text{-}\alpha)$ and $(\text{RIC}^{\text{ST}}\text{-P})$ must be binding. Suppose by contradiction that $(\text{RIC}^{\text{ST}}\text{-P})$ is binding whilst $(\tilde{\text{R}}\text{IC}^{\text{OV}}\text{-}\alpha)$ is slack at $b^{\text{ST}}(\delta)$. Then b can be increased, which increases $c_B(b)$ and $v_B(b)$, keeping both $(\text{RIC}^{\text{ST}}\text{-}\alpha)$ and $(\text{RIC}^{\text{ST}}\text{-P})$ satisfied, thus making higher levels of b implementable: a contradiction. Suppose next that $(\text{RIC}^{\text{ST}}\text{-P})$ is slack whilst $(\tilde{\text{R}}\text{IC}^{\text{OV}}\text{-}\alpha)$ is binding at $b^{\text{ST}}(\delta)$. Then b , adjusting $t_B(b)$, so that both $(\text{RIC}^{\text{ST}}\text{-}\alpha)$ and $(\text{RIC}^{\text{ST}}\text{-P})$ remain satisfied. From $(\text{RIC}^{\text{ST}}\text{-}\alpha)$ binding, we obtain $t_B = \frac{c_B(b)}{\delta}$. Substituting for this value in $(\text{RIC}^{\text{ST}}\text{-P})$, we obtain condition (5).

(ii) With sequential timing following, the set of sustainable relational contracts satisfies $(\text{IR}^{\text{ST}}\text{-P})$, $(\text{IR}^{\text{ST}}\text{-}\alpha)$ and $(\text{RIC}^{\text{ST}}\text{-}\alpha)$. However, when $(\text{RIC}^{\text{ST}}\text{-}\alpha)$ is satisfied, $(\text{IR}^{\text{ST}}\text{-}\alpha)$ is also satisfied. Thus we can ignore $(\text{IR}^{\text{ST}}\text{-}\alpha)$. Noting that $(\text{RIC}^{\text{ST}}\text{-}\alpha)$ is easier to satisfy the higher is t_B , the set of sustainable b is maximized at the maximum t_B compatible with $(\text{IR}^{\text{ST}}\text{-P})$, which gives $t_B = v_B(b)$. Substituting for $t_B = v_B(b)$ in $(\text{RIC}^{\text{ST}}\text{-}\alpha)$ we obtain expression (6).■

Proof of Proposition 1. Summing up $(\text{RIC}^{\text{OV}}\text{-P})$ and $(\text{RIC}^{\text{OV}}\text{-P})$, we obtain

$$\text{RIC}^{\text{OV}} : \frac{v_B(b) - c_B(b)}{1 - \delta} \geq v_B(b) + p_A - \min[p_A, F^P] + \mu F^\alpha - \frac{\delta \min[p_A, F^P]}{1 - \delta} - \frac{\min[F^\alpha, c_A(a)]}{1 - \delta} + \delta \frac{p_A}{1 - \delta}.$$

By inspection, F^P should be maximized, as it appears with a negative sign on the RHS of the inequality; thus $F^P = p_A$. Now suppose $F^\alpha \leq c_A(a)$, then (RIC^{OV}) becomes

$$\frac{v_B(b) - c_B(b)}{1 - \delta} \geq v_B(b) - \frac{1 - \mu(1 - \delta)}{1 - \delta} F^\alpha,$$

and as F^α appears with a negative sign on RHS of (RIC^{OV}) , the set of sustainable contracts is found by maximizing F^α , thus setting $F^\alpha = c_A(a)$. If instead $F^\alpha \geq c_A(a)$, then the RHS of (RIC^{OV}) increases in F^α , implying that the set of feasible relational contracts is found by setting $F^\alpha = c_A(a)$. ■

Proof of Lemma 2. Suppose that $t_B \leq 0$. In this case a deviation by the principal only results in levying the fine; since t_B is non-positive, it is the agent who can withhold payment to the principal. The relational incentive constraints therefore become

$$R\tilde{I}C^{\text{OV}} - P : \frac{v_B(b) - p_A - t_B}{1 - \delta} \geq v_B(b) - t_B - p_A + \mu F^\alpha - \frac{\delta \min[p_A, F^P]}{1 - \delta}$$

and

$$R\tilde{I}C^{\text{OV}} - \alpha : \frac{t_B + p_A - c_B(b)}{1 - \delta} \geq p_A - \min[F^\alpha, c_A(a)] + \delta \frac{p_A - \min[F^\alpha, c_A(a)]}{1 - \delta}.$$

Summing up these two constraints (fines are unchanged), we have

$$R\tilde{I}C^{\text{OV}} : \delta v_B(b) + (1 - \delta)t_B - c_B(b) + c_A(a)(1 - \mu(1 - \delta)) \geq 0,$$

where the LHS is increasing in t_B , thus suggesting the optimality of $t_B = 0$. ■

Proof of Proposition 2. The set of feasible relational contracts with overcontracting maximizes b subject to $(\text{IR}^{\text{OV}}\text{-P})$, $(\text{IR}^{\text{OV}}\text{-}\alpha)$, $(\tilde{R}\tilde{I}C^{\text{OV}}\text{-}\alpha)$ and $(\tilde{R}\tilde{I}C^{\text{OV}}\text{-P})$. Since p_A only affects $(\text{IR}^{\text{OV}}\text{-P})$, $(\text{IR}^{\text{OV}}\text{-}\alpha)$, then any $p_A \in [c_B(b), v_B(b)]$ is feasible. Now let $b^{\text{OV}}(\delta)$ denote the highest sustainable b . We show that at b^{OV} , both $(\tilde{R}\tilde{I}C^{\text{OV}}\text{-}\alpha)$ and $(\tilde{R}\tilde{I}C^{\text{OV}}\text{-P})$ must be binding. Suppose by contradiction that $(\tilde{R}\tilde{I}C^{\text{OV}}\text{-P})$ is binding whilst $(\tilde{R}\tilde{I}C^{\text{OV}}\text{-}\alpha)$ is slack. Then $c_A(a)$ can be reduced so as to keep $(\text{RIC}^{\text{OV}}\text{-}\alpha)$ satisfied whilst loosening $(\tilde{R}\tilde{I}C^{\text{OV}}\text{-P})$, making higher levels of b implementable: a contradiction. Suppose next that $(\text{RIC}^{\text{OV}}\text{-}\alpha)$ is binding whilst $(\tilde{R}\tilde{I}C^{\text{OV}}\text{-}\alpha)$ is slack. Then, we can increase b and a so as to leave $(\tilde{R}\tilde{I}C^{\text{OV}}\text{-}\alpha)$ binding and keep $(\tilde{R}\tilde{I}C^{\text{OV}}\text{-P})$ satisfied. Setting both $(\tilde{R}\tilde{I}C^{\text{OV}}\text{-}\alpha)$ and $(\tilde{R}\tilde{I}C^{\text{OV}}\text{-P})$ binding we obtain expression (10). ■

Proof of Proposition 3. With $v_A(a) > 0$, the relational constraint of the principal modifies to

$$RIC^{OV} - P : \frac{v_B(b) - p_A}{1 - \delta} \geq v_B(b) - \min [p_A, F^P] + \mu F^\alpha + \frac{v_A(a) - \delta \min [p_A, F^P]}{1 - \delta},$$

whilst $v_A(a)$ has no effect on $(RIC^{OV}-P)$, $(IR^{OV}-P)$ and $(IR^{OV}-\alpha)$. Since the LHS of $(RIC^{OV}-P)$ is independent of $v_A(a)$ whilst the RHS is increasing in $v_A(a)$ and since the set of sustainable relational contracts is maximized when $(RIC^{OV}-P)$ binds, the result follows. ■

Proof of Proposition 5. With renegotiation, the relational incentive constraints of the principal and the agent become respectively (fines are unchanged)

$$R\hat{I}C^{OV} - P : \frac{v_B(b) - p_A}{1 - \delta} \geq v_B(b) - p_A + c_A(a) - \delta \frac{p_A - \frac{1}{2}c_A(a)}{1 - \delta} - \frac{z}{2}$$

and

$$R\hat{I}C^{OV} - \alpha : \frac{p_A - c_B(b)}{1 - \delta} \geq p_A - c_A(a) + \delta \frac{p_A - \frac{1}{2}c_A(a)}{1 - \delta} - \frac{z}{2}. \quad (12)$$

Suppose that $\frac{\delta c_B(\hat{b}^{OV})}{1 - \delta} \geq z$. The two relational constraints simplify to

$$R\hat{I}C^{OV} - P : \delta v_B(b) \geq c_A(a) \left[\mu (1 - \delta) + \frac{\delta}{2} \right] - (1 - \delta) \frac{z}{2}$$

and

$$R\hat{I}C^{OV} - \alpha : c_A(a) \left(1 - \frac{\delta}{2} \right) \geq c_B(b) - (1 - \delta) \frac{z}{2}.$$

Following the same reasoning as in the proof of Proposition 2, the set of sustainable relational contracts is found by choosing a and b such that $(R\hat{I}C^{OV}-\alpha)$ and $(R\hat{I}C^{OV}-P)$ are binding. This gives

$$c_A(\hat{a}^{OV}) \left(1 - \frac{\delta}{2} \right) = c_B(\hat{b}^{OV}) - (1 - \delta) \frac{z}{2}$$

and

$$\delta v_B(\hat{b}^{OV}) - c_B(\hat{b}^{OV}) \frac{2(1 - \delta)\mu + \delta}{2 - \delta} + (1 - \delta)z \frac{1 + \mu(1 + \delta)}{2 - \delta} = 0,$$

with $\frac{\delta}{1 - \delta} c_A(\hat{a}^{OV}) - z = 2 \frac{\delta c_B(\hat{b}^{OV}) - z(1 - \delta)}{(1 - \delta)(2 - \delta)} > 0$ for $\frac{\delta c_B(\hat{b}^{OV})}{1 - \delta} \geq z$. Then the parties will prefer not to renegotiate the contract during the punishment phase and the analysis

is equivalent to the case developed in Section 4.3. Thus the set of feasible relational contracts is given by (10).■

Proof of Corollary 1. Suppose that the principal and the agent agree to a short term contract and to renegotiate it as long as parties do not defect. The relational incentive constraints of the principal and the agent become respectively (fines are unchanged)

$$RIC_{Short}^{OV} - P : \frac{v_B(b) - p_A}{1 - \delta} \geq v_B(b) - p_A + c_A(a)$$

and

$$RIC_{Short}^{OV} - \alpha : \frac{p_A - c_B(b)}{1 - \delta} \geq p_A - c_A(a).$$

Simplifying we obtain

$$RIC_{Short}^{OV} - P : \delta (v_B(b) - p_A) - c_A(1 - \delta) \geq 0$$

and

$$RIC_{Short}^{OV} - \alpha : \delta p_A - c_B(b) + c_A(1 - \delta) \geq 0.$$

Summing up the two constraints we obtain

$$\delta v_B(b) - c_B(b) \geq 0,$$

which characterizes $\Phi_{Short}^{OV}(b)$ and, being identical to (11), shows that $\Phi_{Short}^{OV}(b) = \tilde{\Phi}^{OV}(b, \delta, z)$ at $z = 0$. This proves the first statement. The second one follows directly from the Proposition.■

Proof of Corollary 2. Consider the case of overcontracting with no renegotiation. We know from Lemma 2 and the proof of Proposition 2 that the set of sustainable relational contracts is maximized by choosing a such that $c_A(a) = c_B(b)$, making $(\tilde{R}IC^{OV} - \alpha)$ binding. The result then follows by noting that $(\tilde{R}IC^{OV} - \alpha)$ in expression (8) is satisfied at $p_A(b) = c_A(a) = c_B(b)$ and fines satisfying Lemma 1. Now consider the case of renegotiation. We know from the proof of Proposition 5 that the set of sustainable relational contracts is such that $c_A(a) \left(1 - \frac{\delta}{2}\right) = c_B(b) - (1 - \delta) \frac{z}{2}$. The result then follows by noting that $(\tilde{R}IC^{OV} - \alpha)$ in expression (12) is satisfied at $p_A(b) = c_B(b)$ and $c_A(a) \left(1 - \frac{\delta}{2}\right) = c_B(b) - (1 - \delta) \frac{z}{2}$.

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