Formal Contracts Without Courts. Scoring Suppliers For Building Trust*

Juan José Ganuza†**and Fernando Gomez**‡

First version:: January 2015. This version:: April 2016.

Abstract

Why firms use contracts in a lawless world? Recent empirical findings point at the actual use of explicit formal contracts by business as alongside substantial informal elements in their dealings, subject only to reputational or other reciprocity-based consequences. In this paper we formally show the supporting role that formal contracts play for relational contracts. Even entirely disregarding contract enforcement through a Court or arbitrator, we formally show that formal contracts (but known by the parties as not meant to be enforced, or as non-enforceable) may have an important and positive influence on the reputational or reciprocity-based sanctions that firms may impose upon their suppliers in order to sustain cooperation in relational contracts. We demonstrate that setting compliance with certain tasks in a formal contract reduces the cost of reputational punishments that firms may need to inflict in order to ensure the right incentives to provide effort. We also show that formal contracts impact the way in which reputational punishments will be structured: Formal contracts optimally induce a more eschewed pattern of sanctioning, compared to a benchmark case in which no formal contract has been agreed. Thus, when dealing with its counterparties a firm will be, when the relational contract comes together with a formal contract, less forgiving with those counterparties who have not performed the formal contract, and more forgiving with those other ones who have not infringed the provisions of the formal document.

JEL classification numbers: K13, K23, L51, H24.

---

*We are grateful to Lisa Bernstein, Patrick Bolton, Tano Santos and participants at the ALEA 2015 Annual Conference at Columbia Law School, and Barcelona Jocs for usefull comments. The usual disclaimers apply.

†Department of Economics, Universitat Pompeu Fabra and Barcelona GSE. E-mail: juanjo.ganuza@upf.edu. Juan-José Ganuza gratefully acknowledges the support of the Barcelona GSE Research, the government of Catalonia, and the Spanish Ministry of Education and Science through project ECO2011-28965.

‡Department of Law, Universitat Pompeu Fabra. E-mail: fernando.gomez@upf.edu. Fernando Gomez acknowledges the financial support of the Spanish Ministry of Science and Innovation under project DER 2010-15624, of ICREA, an agency of the Government of Catalonia.

1 Introduction

Since the landmark findings of Macaulay (1963) concerning views and practices on commercial contracting among US businesspeople, informal dealings in contracts have been at the forefront of the economic understanding of inter-firm cooperation. A new survey of businesses in various industries confirms Macaulay's fundamental observation that firms do not rely on legal enforcement in order to ensure cooperation with contracting partners (Bozovic and Hadfield, 2013). This more recent evidence shows, however, at least in respect of those business sectors that possess an important innovative dimension requiring external contracting with other firms, that formal contracting is widely used, despite there is recognition of the fact that legal enforcement of the contract is not a realistic outcome.

In this paper, we try to offer a theory about such observed pattern of behaviour in inter-firm contracting. We provide a formal model showing how drafting a formal legal contract, even absent litigation or third party enforcement (because the explicit contract is non-enforceable, perhaps due to verifiability issues, or it is too difficult to enforce, perhaps to due ex-post costs of Court enforcement, or simply because all parties know that the contract will not be actually enforced)[1] helps to build trust between the parties in a relational interaction in which the incentive mechanism is provided by reputational or reciprocity-based sanctions. The existence of a formal contract document, even if known to the parties that it will not be enforced in case something goes wrong, provides valuable information and improves the incentives built upon sanctions that are purely relational, not legal. It is not the "enforcement" side of the legal document which is valuable –because we assume there will never be enforcement- but the informational dimension of it that makes it attractive for the parties to sign. Our model builds on previous work of ours (Ganuza et al. 2015) that shows how, in settings of product markets with asymmetric information

[1] In a setting of a large buyer dealing with a number of suppliers, the fact it is public knowledge that the formal document with its terms and conditions will not be enforced in the future may also have the effect of alleviating the concerns of other suppliers in a buyer's network of being held-up.

about product quality, the legal system may simultaneously reduce the cost of market sanctions, and sustain cooperation for a larger set of relevant parameter values. We now use a related approach in a context of a relational interaction between firms and where the tasks determined in a non-enforceable document are correlated with unobservable effort and improve incentives.

The persistence and relevance of the phenomenon we are trying to explain –formal contracts setting certain tasks within an interaction that is essentially relational- seems to be well documented. In a very recent paper, Bernstein (2015) presents a detailed analysis of the interaction between large industrial buyers and their suppliers in the US Midwest. That paper shows the use of scorecards for suppliers, rating them on various objective performance metrics, future business depending on consistent results in such scores. The explicit agreements include contractual provisions trying to improve the buyer's assessment of the suppliers's performance when it is not perfectly observable, in order to avoid making a given failure the trigger for termination on other negative reactions affecting existing relational contract.

Given these findings, it does not come as a surprise that relational contracts (contracts in which cooperation is not induced by external adjudication and enforcement, but by the parties' concern about future dealings with the counterparty or with other contracting partners) have received, and deservedly so, large theoretical and empirical attention.[2] The role of informal contract relationships, social norms in business networks, and reputation within the networks has also been identified and explored in various historical and economic circumstances.[3]

Recently, a wave of important Law and Economics papers has revisited the interaction of relational contracting with legal drafting of formal and binding contracts, and to a lesser extent, the legal enforcement of such written and formal contractual instruments: Gilson, Sabel and Scott (2009, 2010, 2013); Bozovic and Hadfield (2013); Baker and Choi (2014) and Berstein (2015). With somewhat different accents and arguments, all of these recent papers informally present and illustrate the advantages that under certain scenarios, firms may obtain when complementing

[2]See, MacLeod (2007) and Malcomson (2012) for useful surveys of the literature.

[3]See, Greif (1989, 2012); Bernstein (1992, 2001); Baker, Gibbons and Murphy (2002), Baker and Hubbard (2004).

their relational contract with formal documents that may help, through different channels, not necessarily involving the legal enforcement through Courts, Tribunals, or arbitrators, the outcome under relational contracting. Some papers in the economic theory of relational contracts had allowed for, and analyzed, the effects of having a formal explicit contract written over some subset of verifiable actions, on the functioning of the relational implicit contract: Baker, Gibbons and Murphy (1994, 2011); Schmidt and Schnitzer (1995). These papers, however, use a framework in which breach (non-cooperative actions) are perfectly observable. The recent Law and Economics papers just referred, and this paper, analyze relational contracts when the cooperative action of the relevant party is not perfectly observable.

The present paper explores a setting of a relational contract between two firms, where there is asymmetric information about the effort invested by the seller or producing party in a given project, and where the observable outcome of the project provides only an imperfect signal of the underlying effort. We consider that the parties are able to draft a formal contract, albeit it is wholly unenforceable. The reasons for non-enforceability of the formal legal contracts may be manyfold: (i) The performance or breach actions of the formal contract may be unverifiable before a Court or other third party enforcer, or they may be insufficiently definite so as to merit legal enforceability, given that Contract Law refuses to enforce obligations that lack sufficient "definitiness"; (ii) the costs of pursuing enforcement of the formal contract before a Court or an arbitrator may be too costly given the expected benefits in terms of damages or other transfers or remedies that may be imposed by the adjudicator, and this excess of litigation costs over expected value of litigation is common knowledge to both contract parties; (iii) the parties themselves draft the formal document but deprive it of legal enforceability by declaring it nonbinding (a mere gentlemen's agreements).

The reason why the players may wish to resort to drafting the formal contract (and incur the costs that it may very possibly entail) is that the performance or breach of the obligations set out in the formal contract may be better observable than the underlying effort (the relevant choice variable that the parties would optimally wish to influence) and may be correlated, however imperfectly, with the level of effort which constitutes the true variable of interest.[4]

For instance, the parties, aware of the fact that the effort taken by the relevant party will only be very imperfectly observable through its effect on the likelihood of success of the project, although the latter may also be influenced by a wide range of other factors, may prefer to sign a formal contract that imposes upon the party who has to provide the effort a set of tasks whose costs, or whose likelihood of performance, are correlated with the level of effort chosen. One could think of writing and submitting progress reports (monthly, or quarterly, or with a different timing), making presentations from time to time so to update the other party, submitting detailed information on costs incurred, or simply informally conveying information to the counterparty on the development of the project. These ancillary tasks do not provide an actual benefit on the other side. But the latter, nonetheless, may prefer to invest time an effort in putting them in writing in a legally drafted document. Not because the customer firm intends to bring the other party to Court if one of those ancillary tasks is not performed (probably the costs of the lawsuit widely exceed the expected damages to be obtained from the breach of a minor ancillary obligation), but to improve the quality of the signal about the level of effort taken by the producing firm.

In such a setting we formally show two results of the use of formal (yet non-enforceable) contracts on the reputational or reciprocity-based sanctions that firms may impose upon their suppliers of goods and services. One is that formal contracts reduce the cost of reputational punishments than firms may need to inflict upon their suppliers in order to keep them under the right incentives to provide effort. Obviously, given that those reputational sanctions that may actually occur are socially costly, formal contracts may provide net (of the transaction costs necessary to draft them) welfare benefits. The other is that formal contracts make reputational punishments more eschewed than they would otherwise be. In other words, the firm will be, when the relational contract comes together with a formal contract, less forgiving with the counterparties

[4] In this respect, our idea has a flavor of those models where the contract can be a signal: Spier (1992); Hermalin (2002).

who have not performed the formal contract, and more forgiving with the other who have not infringed the provisions of the formal contract. In fact, the optimal reputational sanctioning policy is completely dichotomous: to be fully forgiving with those contractors who perform the formal contract, even if the project did not succeed, and to be fully unforgiving -that is, strike them out forever from the list of potential counterparties- with those whose project fail, and at the same time do not perform the formal contract.

Our general results are based on the probability of performance of the contractually foreseen tasks being affected by the underlying effort. When it is the cost of such tasks that is influenced by the level of effort, we show if there are enough difference between the cost of undertaking the formal tasks under high and low effort, the non enforceable contract $C(a)$ may improve the relational contract. We denote this as the cost channel and it basically depends on two effects, on one hand as the cost of the task is higher under low effort, this softens the incentive compatibility constraint (+ incentive effect). on the other hand, introducing additional costs reduces the value of the relationship which also has a negative impact over incentives (-loss of value effect). We characterize the conditions under which the positive incentive effects dominates the loss of value effect, and the cost channel is effective in improving the efficiency of the relational contract.

Our paper and results are obviously related to that strand of the contracting literature mentioned above. However, it differs from those papers on several grounds. First, we provide a formal model of the interaction of formal contracting with the relational contract and its reputational sanctions. Second, we emphasize the informative quality of the signal that ancillary tasks entrusted to one party in the formal contract may possess for the customer side of the contractual relationship. The key factors in the other papers are related to ours, but somewhat different.

In an important series of papers, Gilson, Sabel and Scott (2009, 2010, 2013) provide complementary analyses of the phenomenon they label as "braiding", the use of legal contracts to support informal contracting specially in technology-intensive industries. They place their lens especially on provisions of formal agreements that commit to exchange information between the parties, and those that establish conflict-solving schemes, bodies and procedures. With this, the parties not only may eventually improve observability, but also increase the joint understanding of the parties concerning the development of their relationship (bringing the parties' beliefs closer), learn about the capabilities and the cooperative or non-cooperative features of the partner, and build increased trust among the parties. They also correctly underline how Courts, with different interpretive and enforcement strategies (essentially what they label "low-powered enforcement" such as imposing obligations to negotiate in good faith, but not delivery and payment over the main subject matter of the contract) may help the parties to fruitfully use the formal side of contracting to support the informal strands of their relationship, and how mistaken Courts' choices may interfere with the desirable helping hand function of legal contracts and Contract Law.

Bozovic and Hadfield (2013) provide important empirical findings about how in many industries the standard Macaulay's type of response remains prevalent 50 years later, albeit with the interesting twist of being pervasive that in innovation-oriented industries and relationships: parties are still reluctant to go to Court to adjudicate disputes and determine outcomes, but they make heavy use of formal documents, involving extensive legal advice, in the negotiation and agreement of the contracts. They also contribute a theory trying to explain the observed dichotomy of contracting practices in industries with or without relevant innovation-related external contracts, that they label "scaffolding". In their theory, when uncertainty about the future desirability of certain actions is very high, the parties cannot rely on formal contracts to determine them, but they cannot rely on informal but shared understanding by the parties either. Thus, parties may profitably opt to use the strong "classification" properties and abilities of Contract Law, by signing a formal contract, and relying on the rules, doctrines, and interpretive strategies of Contract Law to further down the road to determine if there is performance or breach in concretely realized contingencies. Moreover, by relying on a trusted set of classification properties, parties are able to align better what will be the future understanding of how parties would consider that future action in that future set of circumstances. Thus, the formal contract and Contract Law, even absent litigation and Court intervention, will be able to bridge the gap in beliefs and understandings by the parties. This is what they name as "scaffolding".

Baker and Choi (2014) analyze a setting of a relational contract in which Court enforcement is possible, that is, parties may resort to both reputational and legal sanctions, both of them costly. Legal sanctions provide two advantages compared to the setting of a pure relational contract. First, contract damages -that are different in nature and size from the future benefit of the transaction to the breaching party, which provides the size of the reputational sanction as well as the cost of it- allow parties to decuple the benefit of the legal sanction in terms of deterring undesirable breach, from the cost of implementing the sanction, which is given by litigation costs. Second, a formal contract breach litigated case may allow the parties to uncover more evidence of the true behavior of the other parties, and thus to better tailor the reputational sanctions.

Our paper is also related to Gil and Zanarone (2014), although their focus of interest is to present a model of the optimal use of informal and formal contracts that would provide a relatively simple set of implications as to the factors affecting the use of just one or the other option (formal or informal) or a combined use (formal and informal) in terms of contracting strategies.

The structure of the paper will be as follows: Section 2 will present the basic setting. Section 3 will model the relational contract without formal contracting. Section 4 presents how the relational contract will be influenced by the parties drafting a legal and formal contract that, however, will not be enforced. Section 5 extends our basic model when the costs of performing the contractually agreed tasks are considered. Section 6 analyzes the optimal investment in contracting. Section 7 presents some implications. Section 8 briefly concludes. All proofs are relegated to the Appendix.

2 The Model

A producer firm (PF) undertakes a project for a customer firm (CF). The outcome of the project is uncertain but the probability of project (e.g developing an innovative process or product) being successful depends on the effort exerted by the PF. In particular, we assume that the

PF decides between two possible levels of effort, $e \in \{\underline{e}, \overline{e}\}$. The choice of the effort is private information (not observable by CF) and not directly contractible. Exerting effort is costly, $c_{\underline{e}} < c_{\overline{e}}$, and determines the probability of success, $p_{\underline{e}} < p_{\overline{e}}$. For simplicity and without loss of generality, we take $c_{\underline{e}} = 0, c_{\overline{e}} = c$, $p_{\underline{e}} = 0$ and $p_{\overline{e}} = \pi$.

If the project is successful, it delivers profits $V > 0$. High effort is socially efficient, $\pi V - c > 0$. PF is financially constrained and it cannot bear the risk of financing the project. CF pays an exogenous price P to PF for undertaking the project, as $\pi V > P > c$. In order to keep the model as simple as possible, we initially take as exogenous the price paid by the CF, P. Later on, we endogenize P, and show that beside the fact that prices will be influenced by the transaction cost incurred by PF, our main results hold. Given these assumptions, CF would be willing to contract with the PF if effort is high ($\pi V > P$), but not otherwise.

In a static framework, CF correctly anticipates that given that the effort is not observable and contractible, PF has strong incentives to shirk and therefor there will be no trade. Parties can overcome this market failure when the interaction is repeated by using a relational contract.

3 Building Trust

Now we consider an infinite horizon framework with an infinitely lived PF and an infinitely lived CF, in which the basic game above is repeated over and over again. As in the static game, contracts cannot be verified by a third party who could enforce a explicit provisions of a formal contract.

This repeated game has multiple equilibria, including the repetition of the solution to the static game. We will focus on equilibria supporting cooperation between PF and CF. In particular, we consider the following grim strategy subgame perfect equilibrium inspired by Green and Porter (1984):

- CF starts trusting PF in period 1, and financing the project by paying price P.

- There is trade, PF chooses high effort and CF trusts PF by financing the project through the price P until a project failure occurs.

- When CF observes a project failure, she reacts by discontinuing to finance the project for T periods. After expiration of the T periods, CF is willing to resume the relationship with PF again.

Following Ganuza et al (2011), we will denote the missing trade surplus in T periods incurred as the "cost of reputation". Both agents would be better off if they do not stop trading during the punishment phase. However, punishment is necessary to preserve incentives.

We are in a setting of ex-post imperfect information: the fact that the project has failed is an imperfect signal of PF's level of effort. If the signal were perfect, then T could be infinite and the cost of reputation would be 0, since punishment would never be imposed in equilibrium. In our setting, the imperfect information leads agents to incur a cost of reputation. We will focus on the "optimal" relational contract, the one that maximizes the number of periods in which trade occurs, or, equivalently, minimizes the number of periods in which the reputational sanction is imposed.

We assume that both agents face the same discount factor, $\delta \in (0,1)$. When CF and PF play the strategy described above, let V^+ and V^- be the present discounted value of the PF profits depending on PF's level of effort, high and low, respectively. We have:

$$\begin{aligned} V^+ &= P - c + \pi\delta V^+ + (1-\pi)\,\delta V^-, \\ V^- &= \delta^T V^+. \end{aligned}$$

Solving the equation system we obtain both present values in terms of the parameters of the model

$$V^+ = \frac{P-c}{1-\pi\delta-(1-\pi)\,\delta^{T+1}}, \tag{1}$$

$$V^- = \delta^T V^+ = \frac{\delta^T(P-c)}{1-\pi\delta-(1-\pi)\,\delta^{T+1}}. \tag{2}$$

Finally, to achieve this equilibrium we must add an incentive compatibility constraint. The following inequality captures the lack of incentives of PF to choose low effort:

$$V^{+} \geq P + \delta V^{-}$$

Using the definition of $V^{+} = P - c + \pi\delta V^{+} + (1-\pi)\,\delta V^{-}$, the incentive compatibility constraint can also be written as:

$$\pi\delta\left(V^{+} - V^{-}\right) \geq c. \tag{3}$$

We are interested in another equivalent expression for the inequality above, which can be found using the solution to the equation system V^{+} and V^{-} (we plug equations (1) and (2) into (3)):

$$\pi\delta\frac{(1-\delta^{T})(P-c)}{1-\pi\delta-(1-\pi)\,\delta^{T+1}} \geq c.$$

Let $\Phi(T)$ be the left side of the incentive compatibility constraint above. For our purposes, this function has a useful property:

Lemma 1 *$\Phi(T)$ is increasing in T.*

Hence, to solve optimally the infinitely repeated game, we want to choose T in order to maximize V^{+}.

$$\max_{T}\ V^{+} = \max_{T}\ \frac{P-c}{1-\pi\delta-(1-\pi)\,\delta^{T+1}}$$

subject to the following constraint:

$$\Phi(T) \geq c.$$

Given that our function satisfies $\frac{\partial V^{+}}{\partial T} < 0$, then the optimal T^{*} for our problem will be the minimum T that satisfies the identity $\Phi(T^{*}) = c$. But this equation has a unique solution, by Lemma 1.

The optimal punishment T^{*} has been characterized for a given value of the discount factor δ, probability of success of the project under high effort π, and marginal profit $P-c$ of PF. Next Lemma establishes how the optimal punishment T^{*} depends on this set of parameters.

Lemma 2 *The optimal punishment T^* is decreasing in π, $P - c$ and δ.*

The intuition of Lemma 2 is as follows. The cost of reputation decreases with π since it is a measure of the level of imperfect information (higher π implies lower asymmetric information, that is failure is a more informative signal of low effort by PF), and decreases with $P - c$ and δ, since they increase the cost for PF of the missing trade following project failure.

4 Trust with Formal but Non Enforceable Contracts

In this section we explore the role that a formal contractual agreement that is not enforceable (for instance, due to lack of sufficient certainty in the agreement, and thus failure to reach the status of a legally enforceable contract) or, being theoretically enforceable, the enforcement cost are so high that it will never be actually enforced, this outcome being common knowledge. The document, though known to both parties never to be enforced by a third party adjudicator (typically a Court) may increase trade and welfare by improving the performance of the relational contract.

Then, in our previous setup we introduce a formal contractual document or agreement between CF and RF, C, that remains, however, non enforceable, for any of the reasons pointed out above. The goal of C is to specify for PF some intermediate tasks $a \in A$ that may be imperfectly correlated with the real effort invested by PF and thus provide incentives to the agent. CF does not obtain any direct benefits from the task other than obtaining information and giving incentive to PF. The way in which the formal contract $C(a)$ may provide incentives can be approached in various ways. One possibility (that we denote as the cost channel) is that the cost of undertaking the contractually stipulated tasks is smaller if PF has exerted effort, $c(a|\overline{e}) < c(a|\underline{e})$. Another one (the probability channel) is that the probability of success in discharging the contractual tasks is larger when PF has taken effort, $p(a|\overline{e}) > p(a|\underline{e})$. Obviously, both channels may work at the same time. In this section we will focus on the probability channel, and in a later extension we will refer to the cost channel.

The formal contract working through the probability channel works as follows. If the innovation project succeeds, CF learns that high effort has been exerted and the formal contract plays no role. If the innovation project fails, the contract provides imperfect information on effort exerted by PF. Formally, at the end of the innovation process, the formal contract allows the production of a signal $s \in \{s_P, s_{NP}\}$, where the sub-index means performance and not performance of the contract, respectively. The realization of the signal is observable by PF and CF. We initially assume that the contract signal is informative, and we take its informativeness as given. As the signal is informative, the probability of a good signal realization is higher when PF has exerted effort. $P(s_P|\overline{e}) = \alpha > \beta = P(s_P|\underline{e}) = \beta$.

The next step is to analyze the interaction between the formal but non enforceable contract and the relational/informal contract. The main idea is that parties can use the information provided by the formal contract for improving the functioning of the informal contract by tailoring the reputational or relational punishment more tightly to the expost probability that no effort has been exerted.

Formally, we define a new infinite horizon game in which CF makes the relational sanction dependent on the performance of the formal contract. After a project failure, CF observes the signal from the formal contract, and then CF sets the relational sanction accordingly. We proceed as in the previous cases by computing the Present Discounted Value of PF profits given the punishment by CF, now based on the performance of the formal contract (we have included an upper index C to refer to the formal contract). Notice that the formal contract reduces but does not eliminate the asymmetry of information (otherwise this would be equivalent to make the production effort contractible). Then, there may be Type I errors (situations in which PF exerts effort and the formal contracts is not satisfied), as well as Type II errors (situations in which PF does not exert effort but the formal contracts is satisfied). These errors will be key in determining the optimal punishment. In summary, in case of a failure in the project, a relational sanction is triggered, but the length of the punishment depends on the performance of the formal contract

$$
\begin{aligned}
V^{C+} &= P - c + \pi\delta V^{C+} + (1-\pi)\,\delta\alpha V_P^{C-} + (1-\pi)\,\delta(1-\alpha)V_{NP}^{C-}, \\
V_P^{C-} &= \delta^{T_P} V^{C+} \\
V_{NP}^{C-} &= \delta^{T_{NP}} V^{C+}
\end{aligned}
$$

Solving the equation system, we obtain:

$$
V^{C+} = \frac{P-c}{1-\pi\delta-(1-\pi)(\alpha\delta^{T_P+1}+(1-\alpha)\delta^{T_{NP}+1})},
$$

The formal contract also affects the incentive compatibility constraint, so in order to express that the firm has no incentive to exert low effort, now we have:

$$
V^{C+} \geq P + \delta[\beta V_P^{C-} + (1-\beta)V_{NP}^{C-}]
$$

Following similar computations than in the previous section, we obtain the incentive compatibility constraint under formal contracting as the inequality given by:

$$
\Psi^C(T_P, T_{NP}, \alpha, \beta) \geqslant c
$$

where this new function is:

$$
\Psi^C(T_P, T_{NP}, \alpha, \beta) = \frac{\delta\left[\pi + (1-\pi)(\alpha\delta^{T_P} + (1-\alpha)\delta^{T_{NP}}) - (\beta\delta^{T_P} + (1-\beta)\delta^{T_{NP}})\right](P-c)}{1-\pi\delta-(1-\pi)(\alpha\delta^{T_P+1}+(1-\alpha)\delta^{T_{NP}+1})}
$$

Notice that if we impose that penalties are independent of the performance of the formal contract, $T_P = T_{NP} = T$ by construction, $\Psi^C(T, T, \alpha, \beta) = \Phi(T)$.

We are interested in characterizing the optimal relational sanctions with formal but non enforceable contracting, which will be the solution to the following problem

$$
\max_{T_P, T_{NP}} V^{C+} = \frac{P-c}{1-\pi\delta-(1-\pi)(\alpha\delta^{T_P+1}+(1-\alpha)\delta^{T_{NP}+1})}
$$

subject to the incentive constraint:

$$
\Psi^C(T_P, T_{NP}, \alpha, \beta) \geq c.
$$

Then, we need to determine the optimal relational punishment when the firm satisfied the formal contract, T_P, and when the formal contract is not performed, T_{NP}. In order to compare the solution of this problem (with two punishment variables (T_P, T_{NP})) with the optimal relational punishment in the previous framework with only one instrument T, we focus on the impact of the punishment on the objective function. We say that (T_P, T_{NP}) generates lower expected relational punishment costs than T if $\alpha\delta^{T_P+1} + (1-\alpha)\delta^{T_{NP}+1} > \delta^T$. In fact, the solution to the problem is the pair (T_P^*, T_{NP}^*) that satisfies the incentive compatibility constraint and maximizes, $\alpha\delta^{T_P+1} + (1-\alpha)\delta^{T_{NP}+1}$, (minimizes the expected punishment costs).

First, we characterize what is the optimal punishment policy when the information provided by the contract is used.

Proposition 1 *The optimal punishment with formal contracting feedback maximizes the relational punishment in case of non performance of the formal contract (minimizing the punishment in case of performance of the formal contract). This implies that the optimal relational contract* (T_L^*, T_{NL}^*) *may have two formats: i) Never again,* $(T_P^* = T, T_{NP}^* = \infty)$ *and ii) Full forgiveness* $(T_P^* = 0, T_{NP}^* = T)$.

The intuition Proposition 1 is as follows. There is a set of pairs (T_P, T_{NP}) that generated the same expected punishment when PF exerts effort, $\alpha\delta^{T_P} + (1-\alpha)\delta^{T_{NP}} = U$. The optimal solution is characterized by finding the maximum U^* that satisfies the incentive compatibility condition $\Psi^C(T_P, T_{NP}, \alpha, \beta) \geq c$. Using a change of variable we can rewrite Ψ^C as a function of U and $\delta^{T_{NP}^*}$. We show in the proof that Ψ^C is decreasing in U and increasing in δ^{T_P}. The higher the relational punishment (the lower U) the higher the incentives to exert effort, since by doing so PF reduces the probability of punishment. This result implies that incentive compatibility constraint must be binding $(\Psi^C(U^*, \delta^{T_P^*}, \alpha, \beta) = c$. Among all the pairs that generate the same expected punishment U^*, choosing the one with higher δ^{T_P} maximizes incentives of PF to exert effort. Conditional on being punished, the difference between exerting effort or not, is $(\alpha-\beta)(\delta^{T_P} - \delta^{T_{NP}})$, which is maximized with the highest δ^{T_P}. Then, the optimal punishment requires to maximize

δ^{T_P}, implying that if conditions do not require a tough punishment, PF is forgiven if there is project failure, but also the formal contract has been performed. Otherwise, PF is punished in case of performance, but the relationship with CF is completely severed for ever in case of non performance ("never again").

Proposition 2 *The optimal relational punishment with formal contracting feedback,* (T_P^*, T_{NP}^*) *, generates lower expected relational punishment costs than without it,* T^**, i.e.* $\alpha\delta^{T_L^*}+(1-\alpha)\delta^{T_{NL}^*} > \delta^{T^*}$.

This is the main result of the paper. Technically, Proposition 2 is implied by the previous result. Disregarding the information provided by the performance or non-performance of the formal contract, that is, using the same punishment in case of performance and non performance, $T_P = T_{NP} = T^*$, is feasible, but Proposition 1 shows that it is not the optimal solution. By using formal contracting feedback, (T_P^*, T_{NP}^*), lower expected relational punishment cost can be achieved by imposing higher penalties to the case of non performance of the formal contract which is more relative more likely to arise if PF has not exerted effort.

Proposition 3 *The optimal relational punishment with formal contracting feedback* (T_P^*, T_{NP}^*) *is decreasing in the informativeness of the formal contract, decreasing in* α *and increasing in* β*.*

All previous results depends on the assumption that the formal contract is informative on the effort decision of PF $\alpha > \beta$. We take, however, the informativeness of the contract as exogenous. Proposition 3 provides the intuitive result that the more informative the formal contract is, the better the tailoring of the punishment is and consequently that the most efficient the relational contract becomes. Higher informativeness (higher α or lower β) makes the optimal relational contract more effective, since minimizing the punishment in case of performance has higher impact over incentives, the higher is the informativeness of the formal contract, as it is nicely capture by the term $(\alpha - \beta)(\delta^{T_P} - \delta^{T_{NP}})$.

5 Formal Contracts with Scoring.

We have considered that the outcome of the formal contract is binary. This seems to be a natural assumption for enforceable contracts that can be brought to Courts: contracts are performed or breached, standards are satisfied or not, and so on. It is not by chance that legal terms and legal reasoning is to a large extent binary. This would carry over to formal contracts drafted by lawyers trained in this dyadic mode of thinking even when parties know that Court enforcement will rarely be the case. However, the role of formal contract in our setting is to provide information regarding the underlaying effort decision of the PF, not the traditional legal role of securing enforcement. Then, it make sense, to consider that the outcome of the formalized contract relationship is a score, a "grade", rather than a simple binary performance/ non performance outcome. This seems important since the reader may suspect that behind some of our previous results the binary structure of the formal contract is at work.

Therefore, we now generalize the model by allowing the formal contract between CF and PF, C, to deliver a non-binary outcome. In particular, we assume that at the end of the contracting process, the formal contract generates a score signal s that is observable by PF and CF. To ensure that taking high effort translates into more evidence (a higher score) that the agent took high effort, we assume that the signal is monotone, that is, $f(s|e)$ satisfies the Monotone Likelihood Ratio Property (MLRP):

$$\frac{f(s|\overline{e})}{f(s|\underline{e})} \text{ is increasing in } s.$$

This condition ensures that more evidence is "good news" about effort (Milgrom (1981)), that is, $\Pr(\overline{e}|s)$ is increasing in s. For proving the results, it is convenient to take the score s as a discrete variable, $s_1 < s_2 < .... < s_N$. The Monotone Likelihood Ratio Property (MLRP) implies in that case:

$$\frac{\Pr(s_j|\overline{e})}{\Pr(s_j|\underline{e})} > \frac{\Pr(s_i|\overline{e})}{\Pr(s_i|\underline{e})} \text{ if } j > i$$

also equivalently,

$$\frac{\Pr(s_j|\overline{e})}{\Pr(s_i|\overline{e})} > \frac{\Pr(s_j|\underline{e})}{\Pr(s_i|\underline{e})} \text{ if } j > i$$

Following similar computations than in the previous section, we can rewrite the problem as follows

$$\max_{T(s)} V^{C+} = \frac{P-c}{1-\pi\delta-(1-\pi)(\sum \Pr(s_i|\overline{e})\delta^{T(s_i)})}$$

subject to the incentive constraint:

$$\Psi^C(T(s), \Pr(s|\underline{e}), \Pr(s_i|\overline{e})) \geq c.$$

where $\Psi^C(T(s), \Pr(s|\underline{e}), \Pr(s_i|\overline{e}))$ is equal to

$$\frac{\delta\left[\pi+(1-\pi)(\sum_{i=1}^{N}\Pr(s_i|\overline{e})\delta^{T(s_i)})-(\sum_{i=1}^{N}\Pr(s|\underline{e})\delta^{T(s_i)})\right](P-c)}{1-\pi\delta-(1-\pi)(\sum_{i=1}^{N}\Pr(s_i|\overline{e})\delta^{T(s_i)})}$$

Now, $T(s_i)$ is a punishment function that depends on the score obtained by PF in the formal contract C, and $\Pr(s_i|\underline{e})$ and $\Pr(s_i|\overline{e})$ are the distributions of the score that depend on whether or not the PF firm has exerted care. Notice that our previous binary setting is just a particular case of the present formulation.

PROPOSITION 4 *Let* $U^* = \sum_{i=1}^{N}\Pr(s_i|\overline{e})\delta^{T^*(s_i)}$ *be the optimal punishment, then there exists a score* $s^* \in \{s_1, s_2, ..., s_N\}$ *such that if* $s_i < s^*$ *then* $T(s) = \infty$ *(never again), and if* $s_i > s^*$ *then* $T(s) = 0$ *(total forgiveness).*

In other words, there is an optimal standard or minimum score, s^*, such that if the outcome of the formal contract is higher than s^*, PF is forgiven if there is a failure. Otherwise, when the score is lower than s^* and the project fails, the relationship is terminated by CF for ever. The intuition of this result is that between two scores s_i and s_{i+1}, we want to maximize the punishment in s_i (if it is needed), because by doing so, the MLRP ($\frac{\Pr(s_{i+1}|\overline{e})}{\Pr(s_i|\overline{e})} > \frac{\Pr(s_{i+1}|\underline{e})}{\Pr(s_i|\underline{e})}$) implies that the punishment in s_i increases more in relative terms the punishment of the firm when it has exerted low effort, and consequently this increases incentives to exert high effort. Finally, it is important to point out that there are no restrictions over the number of elements and structure of $s^* \in \{s_1, s_2, ..., s_N\}$.Thus, in the limit, this scoring set could be continuous. It is remarkable that the structure of the optimal punishment is very similar to the standard negligence rule.

Proposition 4 generalizes Proposition 1 given that the binary signal was a particular case of the set that we consider in this section. As in the previous section, Proposition 4 implies that disregarding the information provided by the scoring resulting from the formal contract is not optimal. Then, in a way, it generalizes Proposition 2.

For generalizing Proposition 3 that established that the optimal relational punishment with formal contracting feedback is decreasing in the informativeness of the formal contract, we need a criterion of informativeness that we can apply to scores resulting from formal contracts.

Definition 1 *The formal contract, C_1, is more informative than C_2, if $F_1(s|\overline{e}) \leq F_2(s|\overline{e})$ $\nabla s(\sum_{i=1}^{x} \Pr(s_i|\overline{e})_1 \leq \sum_{i=1}^{x} \Pr(s_i|\overline{e})_2$ $\nabla x)$ and $F_1(s|\underline{e}) \geq F_2(s|\underline{e})$ $\nabla s(\sum_{i=1}^{x} \Pr(s_i|\underline{e})_1 \geq \sum_{i=1}^{x} \Pr(s_i|\underline{e})_2$ $\nabla x)$*

Next Proposition states that the informativeness order of the scores based on formal contracts implies all common informativeness criteria based in the value of information for a decision maker (Blackwell sufficiency and Lehmann efficiency.). Those informativeness criteria define informativeness in terms of the value of information in decision making problems: a signal X is more informative than another Y if every decision-maker with preferences in a particular class prefers X to Y. Thus, a signal is more informative if it allows decision-makers to make better decisions and to reduce type I and II decision errors.

Proposition 5 *If the scoring based on contract C_1 is more informative than the scoring from contract C_2, according to definition 1, then C_1 is more informative than C_2 according to Blackwell sufficiency and Lehmann efficiency, and it generates less decision errors.*

Finally, using our concept of contract's informativeness, we can state that more informative formal contracts translates into a more productive relationship and lower reputational sanctions.

Proposition 6 *If contract C_1 is more informative than contract C_2, according to definition 1, then optimal relational punishment under C_1, $\sum_{i=1}^{N} \Pr(s_i|\bar{e})_1 \delta^{T_1^*(s_i)}$ is lower than under C_2, $\sum_{i=1}^{N} \Pr(s_i|\bar{e})_2 \delta^{T_2^*(s_i)}$.*

6 Weakly Enforceable Contracts.

In the previous sections we have assumed that the formal contract between CF and RF, C, is not enforceable by an adjudicator. In this subsection, we consider in our binary framework that the contract is weakly (or imperfectly) enforceable, meaning with this that if the project fails and the contract generates a non performance signal, s_{NP}, the CF is entitled to receive a compensation D (maybe related to the price P) by PF with probability γ. This γD is the expected compensation to CF in case of project failure and non-performance, and the expected sanction PF. It is important however, to introduce some restrictions over the sanction imposed on PF in case of failure. It is reasonable to assume: i) $(1-\beta)D - (1-\pi)(1-\alpha)D > c$; and ii) $P - c > (1-\pi)(1-\alpha)D$. These conditions imply that under full enforceability $\gamma = 1$ of the contract, i) the contract provides enough incentives to exert effort, and ii) that PF can get some surplus and is willing to trade. Notice that these conditions are related to the quality of the contract. In particular, both conditions are easier to meet if a better contract (higher α or lower β) is in place.

How this complication changes the problem of the optimal relational contract? The design of the optimal relational contract with a weakly enforceable formal contracts requires to recompute the Present Discounted Value of PF profits in order to include the expected penalty $(1-\pi)(1-\alpha)\gamma D$.

$$
\begin{aligned}
V^{C+} &= P - c - (1-\pi)(1-\alpha)\gamma D + \pi\delta V^{C+} + (1-\pi)\delta\alpha V_P^{C-} + (1-\pi)\delta(1-\alpha)V_{NP}^{C-}, \\
V_P^{C-} &= \delta^{T_P} V^{C+} \\
V_{NP}^{C-} &= \delta^{T_{NP}} V^{C+}
\end{aligned}
$$

Solving the equation system, we obtain:

$$V^{C+} = \frac{P - c - (1-\pi)(1-\alpha)\gamma D}{1 - \pi\delta - (1-\pi)(\alpha\delta^{T_P+1} + (1-\alpha)\delta^{T_{NP}+1})},$$

Most importantly, contract enforceability also affects the incentive compatibility constraint:

$$V^{C+} \geq P - (1-\beta)\gamma D + \delta[\beta V_P^{C-} + (1-\beta)V_{NP}^{C-}],$$

We can rewrite the IC as:

$$\Psi^{WE}(T_P, T_{NP}, \alpha, \beta, \gamma) \geqslant c$$

where $\Psi^{WE}(T_P, T_{NP}, \alpha, \beta, \gamma)$ is:

$$\frac{\delta\left[\pi + (1-\pi)(\alpha\delta^{T_P} + (1-\alpha)\delta^{T_{NP}}) - (\beta\delta^{T_P} + (1-\beta)\delta^{T_{NP}})\right](P - c - (1-\pi)(1-\alpha)\gamma D)}{1 - \pi\delta - (1-\pi)(\alpha\delta^{T_P+1} + (1-\alpha)\delta^{T_{NP}+1})} +$$
$$+ (\beta - \alpha - (1-\pi)\alpha)\gamma D$$

By construction, if $\gamma = 0$ then $\Psi^C = \Psi^E$. Thus, the optimal relational sanctions with weakly enforceable contracting will be the solution to the following problem

$$\max_{T_P, T_{NP}} V^{C+} = \frac{P - c - (1-\pi)(1-\alpha)\gamma D}{1 - \pi\delta - (1-\pi)(\alpha\delta^{T_P+1} + (1-\alpha)\delta^{T_{NP}+1})}$$

subject to the incentive constraint:

$$\Psi^{WE}(T_P, T_{NP}, \alpha, \beta, \gamma) \geq c.$$

As before, the solution to the problem is the pair $(T_P^{WE*}, T_{NP}^{WE*})$ that satisfies the incentive compatibility constraint and maximizes $\alpha\delta^{T_P+1} + (1-\alpha)\delta^{T_{NP}+1}$ (minimizes the expected punishment costs). All our previous results hold with weakly enforceable contracts: The optimal relational contracts $(T_P^{WE*}, T_{NP}^{WE*})$ have the two formats: never again, $(T_P^{WE*} = T, T_{NP}^{WE*} = \infty)$ or full forgiveness $(T_P^{WE*} = 0, T_{NP}^{WE*} = T)$. The optimal relational punishment $(T_P^{WE*}, T_{NP}^{WE*})$ is decreasing in the informativeness of the formal contract, decreasing in α and increasing in β.

In addition, we can state a new result regarding the impact of the degree enforceability of formal contract in the efficiency of the optimal relational contracts.

Proposition 7 *The optimal relational punishment* $(T_P^{WE*}, T_{NP}^{WE*})$ *is decreasing in the degree of enforceability of the formal contract* γ.

This results goes in line of with our previous paper Ganuza, Gomez and Robles (2015) that shows a complementarity between legal regulation and market reputation. Here, we have showed that if the enforceability of formal contract increases, the optimal reputational sanction decreases, and thus there is a substitution effect between the two dimensions. However, we want to emphasize the complementarity effects between both: enforceability reduces the cost of reputational sanctions. One important implication of this idea is that enforceability makes it possible for co-operation to emerge for a larger set of parameter values. In this dimension, formal and relational contracting are complements.

7 Exploring the Cost-Channel.

The cost channel exists when the cost of undertaking the intermediate tasks $a \in A$ specified in the contract differ with the level of underlying efforts, $c(a|\overline{e}) < c(a|\underline{e})$. We will show that in that case even if we shut off the probability channel by assuming that the intermediate tasks are always undertaken, $P(s_P|\overline{e}) = P(s_P|\underline{e}) = 1$, the non enforceable contract $C(a)$ may improve the relational contracts.[5] The idea is simple, as the PF has to incur in a higher cost when it chooses a low effort, introducing the contract softens the incentive compatibility constraint $\pi\delta\left(V^+ - V^-\right) \geq c + c(a|\overline{e}) - c(a|\underline{e})$ (+ incentive effect). However, introducing the formal contract has also a negative side since it adds an additional cost and reduces the value of the relationship which also has a negative impact over incentives (-loss of value effect). Then the problem becomes

$$\max_T V^+ = \max_T \frac{P - c}{1 - \pi\delta - (1-\pi)\,\delta^{T+1}}$$

[5]Notice that when we are assuming $P(s_P|\overline{e}) = P(s_P|\underline{e}) = 1$, we mean that there is not risk in undetaking the task but we are also implicitely assuming that non undertaking the task will be understood as cheating (exerting $\underline{e}$) and then it is out of the equilibrium path.

subject to the following constraint:

$$\pi\delta\frac{(1-\delta^{T})}{1-\pi\delta-(1-\pi)\,\delta^{T+1}} \geq \frac{c-(c(a|\underline{e})-c(a|\overline{e}))}{P-c-c(a|\overline{e})}.$$

As in our baseline model, the optimal relational contract T^* will be the minimum T that satisfies the incentive compatibility constraint. Lemma 1 and its proof in the appendix states that the left hand side of the incentive compatibility constraint is increasing in T. Then, as we discuss above, the optimal T^* will be decreasing in the cost difference between undertaking or not the effort, $c(a|\underline{e})-c(a|\overline{e})$, (+ incentive effect) and increasing in contract performance costs under high effort $c(a|\overline{e})$ (- loss value effect). These comparative statics can be summarized in the following proposition.

PROPOSITION 8 *(i) The optimal punishment T^*_a is decreasing in $c(a|\overline{e})$ and increasing in $c(a|\underline{e})$. (ii) Let two contracts C_1 and C_2 with two different sets of tasks a and a' and two optimal punishment T^*_a and $T^*_{a'}$, then $T^*_a \leq T^*_{a'}$ iff $\frac{c-(c(a|\underline{e})-c(a|\overline{e}))}{P-c-c(a|\overline{e})} \leq \frac{c-(c(a'|\underline{e})-c(a'|\overline{e}))}{P-c-c(a'|\overline{e})}$.*

It is interesting to illustrate the result with the following example. Consider the tasks as a continuos variable, where $c(a|\underline{e}) = a$ and $c(a|\overline{e}) = \gamma a$. Then, simple computations show that the optimal punishment T^* is decreasing in the number of tasks a if and only if $\gamma \geq \frac{P}{P-c} \geq 1$. In words, including non productive tasks in a non enforceable contract may increase the efficiency of the relational contract as long as the cost difference of undertaking these tasks between exerting or not effort is large enough.

8 Investing in Contracting.

In previous sections we had taken the contract between CF and PF as exogenous, and we have explored independently the probability and the cost channels. Now, we want to consider that the contract (the set of tasks) is chosen optimally in order to maximize the value of the relationship. In addition, tasks, $a \in A$, are characterized by different costs, $\{c(a|\overline{e}), c(a|\underline{e})\}$, and probabilities, $\{P(s_P|\overline{e}), P(s_P|\underline{e})\}$, and are likely to have an impact over the relational contract, through both the probability and the cost channel simultaneously. The precise characterization of the optimal contract should depend on the particular structure of the set of tasks. We take a more parsimonious approach and we define an investment parameter λ, in such a way that the inverse measure of the equilibrium punishment $IP(\lambda) = \alpha\delta^{T_P+1} + (1-\alpha)\delta^{T_{NP}+1}$ increases with λ. Tasks are included in the contract optimally in a way in which the contract investment (the increases in the contract costs due to the new task, $c(a|\overline{e})$) is compensated by the increase in the effectiveness of the relational contract (the reduction of the equilibrium punishment) and the overall effect, increase the value of the relationship. Under such characterization, we can define the optimal level of contract investment λ^* as the solution of the following problem

$$\lambda^* \in \arg\max \frac{P - c - \lambda}{1 - \pi\delta - (1-\pi)IP(\lambda)}$$

It simple comparative static analysis over λ^* provides to interesting results.

Proposition 9 *The optimal investment in contracting λ^* is increasing $P - c$ and may increase or decrease with π.*

The intuition of Proposition 9 is as follows. The optimal contractual investment λ^* increases with $P - c$ since the larger is the trade surplus, the most costly it is the relational punishment and consequently, higher it should be effort in decreasing it. The effect of π over contractual investment λ^* is ambiguous because when π increases, it reduces the asymmetric information and the needs for relational punishment which lead to lower contracting effort, but it also increases the value of the relationship a then the cost of punishment, which increases the value of contracting investment.

9 Implications

The results of the previous sections show how formal contracts that are known to be unenforceable or to remain unenforced are able to help sustain cooperation between contract parties through their effects on the reputational or reciprocity-based sanctions that the contracting parties may impose on each other. Our setting is, however, simplified in several ways (for instance, the contract price is exogenous in the model), and more realistic extensions are feasible. We could endogenize the contract price, taking into account not only the market situation affecting the parties, but also the cost of drafting the formal contract and the cost of satisfying or performing the tasks inserted by the parties as obligations in the latter.

Our findings in the present paper seem to be consistent with the recent empirical evidence that, at least in certain industries characterized by significant outside relationships between firms dealing with innovative projects or dimensions of a larger project, points at the joint use of informal and formal contracting by the parties when structuring their business relationships. We believe that we provide a plausibly general explanation for such empirical finding: the drafting of a formal contract spelling out, with lesser or greater detail, a number of tasks that allow reasonably confident observation as to compliance by the customer does not happen by chance. Parties include tasks that increase the informativeness of the signals that the customer will receive concerning the underlying (and only imperfectly observable) choice of action by the supplying firm. Obviously, this line of argument is not incompatible with other, more informal, explanations for the observed combined use of informal and formal contracts that have been identified by the literature. The parties may resort to formally drafted provisions governing their relationships also to learn more about the contracting partner, or to better align the beliefs about what the desirable actions, and reactions to them, will be in future contingencies severely afflicted by uncertainty at the time of starting the relationship. Also, actual legal enforcement may bring deterrence benefits, and may allow better tailoring of non-legal responses and sanctions.

We think, however, that the goal of increasing the quality of signals about the underlying behavior of the party who is informed about the choice of the relevant action looms large in the parties incurring the time and the expense of drafting contracts, often lengthy and complex ones, that they both know will not end up in Court whatever happens. Thus, the motto "formal contracts without Courts" is not an oxymoron, but a product of the informational structure, apt to be present and operating in a wide range of real world settings.

10 Conclusions

Several observers have noticed the complexity and the multi-faceted nature of the co-existence of informality and formality in business contracting. Very few would dispute that relational elements are pervasive in inter-firm contractual exchanges, and that future dealings -with the same contract partner or with others- play a large role in securing adequate behavior in such interactions. Formal contracting and legal enforcement of the verifiable actions within the relationship, obviously at the core of the legal understanding of contracting phenomena, have been considered often by some strands of the economic thinking on contracting as clearly subordinate, when not irrelevant or even a source of obnoxious interference or crowding out of the less costly and more effective reputational or reciprocity-based mechanisms.

Recently, the supporting role of formal contracting and Contract Law seems to have seen a revival. Our paper belongs to this school of thought concerning the link between the relational and the formal sides of contracting. We have formally shown that legal (yet non-enforceable) contracts exert a positive effect on the reputational or reciprocity-based sanctions that firms may impose upon their suppliers of goods and services. On the one side, setting compliance with certain tasks in a formal explicit contract alongside the informal contracting on the "core" performance, reduces the cost of reputational punishments that firms may need to inflict upon their suppliers in order to keep them under the right incentives to provide "core" effort. Given that reputational sanctions are costly, formal contracts may provide net (of the drafting and eventually other costs of having a formal contract in place) welfare benefits for the contracting parties. On the other side, formal contracts impact the way in which reputational punishments will be structured by the sanctioning contract party. This party will use a more eschewed pattern of sanctioning than if no formal contract had been agreed: when dealing with its suppliers of goods and services, a firm will be, when the relational contract comes together with a formal contract, less forgiving with those counterparties who have not performed the formal contract, and more forgiving with those other ones who have not infringed the provisions of the formal agreement.

Formal contracts, thus, are not just gates to allow future litigation when things go sour. Formal contracts play an important role in improving the informal dealings of business parties.

A Appendix

Proof of Lemma 1: From the main text, $\Phi(T) = \pi\delta\frac{(1-\delta^T)(P-c)}{1-\pi\delta-(1-\pi)\delta^{T+1}}$. Let $\varphi(x) = \frac{1-x}{1-\pi\delta-(1-\pi)x\delta}$. Then, we have $\Phi(T) = \pi\delta\varphi(x(T))$, for $x(T) = \delta^T$. As $x(T)$ is decreasing, in order to show that Φ is increasing in T, we have to show that $\varphi(x)$ is decreasing in x.

$$\begin{aligned}
\varphi'(x) &= \frac{-(1-\pi\delta-(1-\pi)x\delta)+(1-x)(1-\pi)\delta}{(1-\pi\delta-(1-\pi)x\delta)^2} \\
&= \frac{-(1-\pi\delta)+(1-\pi)\delta}{(1-\pi\delta-(1-\pi)x\delta)^2} \\
&= \frac{-1+\delta}{(1-\pi\delta-(1-\pi)x\delta)^2} < 0
\end{aligned}$$

this concludes the proof.

Proof of Lemma 2: We write the binding incentive compatibility condition that characterizes the optimal punishments as follows, $\Phi(T^*(a), a) - c = 0$, where $a \in \{\pi, \delta, P - C\}$. By the implicit function theorem we obtain $T^{*\prime}(a) = -\frac{\frac{\partial\Phi(T^*,a)}{\partial a}}{\frac{\partial\Phi(T^*,a)}{\partial T^*}}$. Given that for Lemma 1 $\frac{\partial\Phi(T^*,a)}{\partial T^*} > 0$, the $sign\{T^{*\prime}(a)\} = -sign\{\frac{\partial\Phi(T^*,a)}{\partial a}\}$. Given that, i) $\frac{\partial\Phi(T^*,P-c)}{\partial P-c} = \pi\delta\frac{(1-\delta^T)}{1-\pi\delta-(1-\pi)\delta^{T+1}} > 0$ and $\frac{\partial T^*}{\partial P-c} < 0$. ii)

$$\begin{aligned}
\frac{\partial\Phi(T^*,\pi)}{\partial\pi} &= (P-c)(1-\delta^T)\delta\left[\frac{1-\pi\delta-(1-\pi)\delta^{T+1}+\pi(\delta-\delta^{T+1})}{(1-\pi\delta-(1-\pi)\delta^{T+1})^2}\right] \\
&= (P-c)(1-\delta^T)\delta\left[\frac{1-\delta^{T+1}}{(1-\pi\delta-(1-\pi)\delta^{T+1})^2}\right] > 0
\end{aligned}$$

and $\frac{\partial T^*}{\partial \pi} < 0$. Finally,

$$\begin{aligned}
\frac{\partial \Phi(T^*,\delta)}{\partial \delta} &= (P-c)\pi\left[\frac{\left(1-(T+1)\delta^T\right)\left(1-\pi\delta-(1-\pi)\delta^{T+1}\right)+(\delta-\delta^{T+1})(\pi+(1-\pi)(T+1)\delta^T)}{\left(1-\pi\delta-(1-\pi)\delta^{T+1}\right)^2}\right]\\
&= (P-c)\pi\left[\frac{\left(1-(T+1)\delta^T\right)\left(1-\delta^{T+1}\right)+(\delta-\delta^{T+1})\ (T+1)\delta^T}{\left(1-\pi\delta-(1-\pi)\delta^{T+1}\right)^2}\right]\\
&= (P-c)\pi\left[\frac{\left(1-\delta^{T+1}-(T+1)\delta^T+(T+1)\delta^{T+1}\right)}{\left(1-\pi\delta-(1-\pi)\delta^{T+1}\right)^2}\right]\\
&= (P-c)\pi\left[\frac{\left(1-(T+1)\delta^T+T\delta^{T+1}\right)}{\left(1-\pi\delta-(1-\pi)\delta^{T+1}\right)^2}\right] > 0
\end{aligned}$$

Where the sign positive comes from the fact that $1-(T+1)\delta^T+T\delta^{T+1}$ is strictly decreasing and 0, when $\delta = 1$, therefore for all $\delta < 1$, the expression is positive. Then $\frac{\partial \Phi(T^*,\delta)}{\partial \delta} > 0$ and $\frac{\partial T^*}{\partial \delta} < 0$. ■.

Proof of Proposition 1:

(i) We rewrite the incentive compatibility constraint.

$$\begin{aligned}
\frac{\delta\left[\pi+(1-\pi)(\alpha\delta^{T_P}+(1-\alpha)\delta^{T_{NP}})-(\beta\delta^{T_P}+(1-\beta)\delta^{T_{NP}})\right](P-c)}{1-\pi\delta-(1-\pi)(\alpha\delta^{T_P+1}+(1-\alpha)\delta^{T_{NP}+1})} &\geq c\\
\frac{\delta\left[\pi(1-(\alpha\delta^{T_P}+(1-\alpha)\delta^{T_{NP}}))+(\alpha-\beta)(\delta^{T_P}-\delta^{T_{NP}})\right](P-c)}{1-\pi\delta-(1-\pi)(\alpha\delta^{T_P+1}+(1-\alpha)\delta^{T_{NP}+1})} &\geq c
\end{aligned}$$

Consider the following change of variable $U = \alpha\delta^{T_P}+(1-\alpha)\delta^{T_{NP}}$, which implies $\delta^{T_{NP}} = \frac{U}{(1-\alpha)} - \frac{\alpha}{(1-\alpha)}\delta^{T_P}$, and then $\delta^{T_P} - \delta^{T_{NP}} = \frac{\delta^{T_P}}{(1-\alpha)} - \frac{U}{(1-\alpha)}$.

$$\frac{\delta\left[\pi(1-U)+(\alpha-\beta)(\frac{\delta^{T_P}}{1-\alpha}-\frac{U}{1-\alpha})\right](P-c)}{1-\pi\delta-(1-\pi)\delta U} \geq c$$

Let $\chi(x) = \frac{\left[\pi(1-x)+(\alpha-\beta)(\frac{\delta^{T_P}}{1-\alpha}-\frac{x}{1-\alpha})\right]}{1-\pi\delta-(1-\pi)\delta x}$. Now, we want to show that $\chi(x)$ is decreasing in x.

$$\begin{aligned}
\chi'(x) &= \frac{(-(\frac{\alpha-\beta}{1-\alpha}+\pi)(1-\pi\delta-(1-\pi)\delta x)+(1-\pi)\delta\left[\pi(1-x)+(\alpha-\beta)(\frac{\delta^{T_P}}{1-\alpha}-\frac{x}{1-\alpha})\right]}{(1-\pi\delta-(1-\pi)\delta x)^2}\\
&= \frac{-\pi(1-\delta)-\frac{(\alpha-\beta)}{1-\alpha}(1-\pi\delta-(1-\pi)\delta^{T_{NP}+1})}{(1-\pi\delta-(1-\pi)\delta x)^2} \leq 0
\end{aligned}$$

As the optimal punishment policy is characterized by the maximum $U = \alpha\delta^{T_L}+(1-\alpha)\delta^{T_{NL}}$ that satisfied the incentive compatibility constraint, and $\chi(x)$ is decreasing, this implies that incentive compatibility constraint must be binding.

Then

$$\frac{\delta\left[\pi(1-U^*)+(\alpha-\beta)(\frac{\delta^{T_P}}{1-\alpha}-\frac{U^*}{1-\alpha})\right](P-c)}{1-\pi\delta-(1-\pi)\delta U^*}=c$$

As the left hand side of the equality is decreasing in U^*, and increasing in δ^{T_P}, this implies that $\frac{\partial U^*}{\partial \delta^{T_P}} > 0$. Then, the optimal policy requires to maximize δ^{T_P} (minimize T_P). This implies that in the optimal solution, $T^*_{NP} \neq \infty \rightarrow T^*_P = 0$, or alternatively $T^*_P \neq 0 \rightarrow T^*_{TP} = \infty$. This concludes the proof. ■

Proof of Proposition 2

As we mention in the main text, the proof that the optimal punishment with formal contracting feedback, (T^*_P, T^*_{NP}), generates lower expected punishment cost than without it, T^*, i.e. $U^* = \alpha\delta^{T^*_P} + (1-\alpha)\delta^{T^*_{NP}} > \delta^{T^*}$, it is just to notice that $T_P = T_{NP} = T^*$ was feasible and it is not optimal. We can also verify this by comparing the two binding incentive compatibility constraints.

$$\frac{\delta\pi(1-U^*)(P-c)}{1-\pi\delta-(1-\pi)\delta U^*}=c-\frac{\delta\left[(\alpha-\beta)(\frac{\delta^{T_P}}{1-\alpha}-\frac{U^*}{1-\alpha})\right](P-c)}{1-\pi\delta-(1-\pi)\delta U^*} \tag{4}$$

$$\frac{\delta\pi(1-\delta^{T^*})(P-c)}{1-\pi\delta-(1-\pi)\,\delta\delta^{T^*}}=c \tag{5}$$

Notice that the left side of both equalities is the same decreasing function of $U^*$and δ^{T^*}respectively. The right hand side of the first equality (4) is lower (the second term is negative) than the right side of (5) and this implies that $U^* = \alpha\delta^{T^*_P} + (1-\alpha)\delta^{T^*_{NP}} > \delta^{T^*}$. ■

Proof of Proposition 3: By the implicit function theorem and $\Psi^C(U^*, \delta^{T^*_P}, \alpha, \beta) = c$, we obtain $\frac{\partial U^*}{\partial \alpha} = -\frac{\frac{\partial \Psi^C}{\partial \alpha}}{\frac{\partial \Psi^C}{\partial U^*}} = -\frac{>0}{<0} > 0$. Similarly, $\frac{\partial U^*}{\partial \beta} = -\frac{\frac{\partial \Psi^C}{\partial \beta}}{\frac{\partial \Psi^C}{\partial U^*}} = -\frac{\leq 0}{<0} < 0$. Finally notice that higher $U^* = \alpha\delta^{T^*_P} + (1-\alpha)\delta^{T^*_{NP}}$ means lower expected relational punishment. ■

Proof of Proposition 4: As in the previous section, the value of the relationship between PF and CF is captured by V^{C+}

$$\max_{T(s)} V^{C+} = \frac{P-c}{1-\pi\delta-(1-\pi)(\sum \Pr(s_i|\overline{e})\delta^{T(s_i)})}$$

that it is increasing in $\sum \Pr(s_i|\overline{e})\delta^{T(s_i)}$. Then, similarly to previous results, the optimal punishment $T^*(s_i)$ maximizes $U^* = \sum_{i=1}^{N} \Pr(s_i|\overline{e})\delta^{T^*(s_i)}$ subject to satisfy the incentive compatibility constraint:

$$\Psi^C(T(s), \Pr(s|\underline{e}), \Pr(s_i|\overline{e})) \geqslant c$$

$$\frac{\delta\left[\pi+(1-\pi)(\sum_{i=1}^{N}\Pr(s_i|\overline{e})\delta^{T(s_i)})-(\sum_{i=1}^{N}\Pr(s_i|\underline{e})\delta^{T(s_i)})\right](P-c)}{1-\pi\delta-(1-\pi)(\sum_{i=1}^{N}\Pr(s_i|\overline{e})\delta^{T(s_i)})} \geqslant c$$

In order to prove the result, take as given the punishment of all scores but the two first ones: $\sum_{i=1}^{N} \Pr(s_i|\overline{e})\delta^{T(s_i)} = \alpha_1\delta^{T_1} + \alpha_2\delta^{T_2} + A$ and $\sum_{i=1}^{N} \Pr(s|\underline{e})\delta^{T(s_i)} = \beta_1\delta^{T_1} + \beta_2\delta^{T_2} + B$. Then, the function $\Psi^C(T(s), \Pr(s|\underline{e}), \Pr(s_i|\overline{e}))$ becomes:

$$\frac{\delta\left[\pi + (1-\pi)(\alpha_1\delta^{T_1} + \alpha_2\delta^{T_2} + A) - (\beta_1\delta^{T_1} + \beta_2\delta^{T_2} + B)\right](P-c)}{1 - \pi\delta - (1-\pi)(\alpha_1\delta^{T_1} + \alpha_2\delta^{T_2} + A)}$$

We make the following change of variable $\overline{U} = \alpha_1\delta^{T_1} + \alpha_2\delta^{T_2}$ and $\delta^{T_2} = \frac{\overline{U}}{\alpha_2} - \frac{\alpha_1\delta^{T_1}}{\alpha_2}$, and we rewrite $\Psi^C(T(s), \Pr(s|\underline{e}), \Pr(s_i|\overline{e}))$ as

$$\begin{aligned} & \frac{\delta\left[\pi + (1-\pi)(\overline{U} + A) - (\beta_1\delta^{T_1} + \beta_2(\frac{\overline{U}}{\alpha_2} - \frac{\alpha_1\delta^{T_1}}{\alpha_2}) + B)\right](P-c)}{1 - \pi\delta - (1-\pi)(\overline{U} + A)} \\ = & \frac{\delta\left[\pi + (1-\pi)(\overline{U} + A) - (\beta_2\frac{\overline{U}}{\alpha_2} + B) - \beta_2\delta^{T_1}(\frac{\beta_1}{\beta_2} - \frac{\alpha_1}{\alpha_2}))\right](P-c)}{1 - \pi\delta - (1-\pi)(\overline{U} + A)} \end{aligned}$$

For the Monotone Likelihood Ratio Property (MLRP), $\frac{\beta_1}{\beta_2} - \frac{\alpha_1}{\alpha_2} > 0$, which implies that for a given $\overline{U}$, Ψ^C is decreasing in δ^{T_1}. In other words, we want to maximize T_1 punishment with respect to T_2 . This implies $\delta^{T_1} = \min\{0, \frac{\overline{U} - \alpha_2}{\alpha_1}\}$ We can repeat this proof for all pairs, T_i and T_{i+1} and obtaining the same result. Then, the global solution has to be $\delta^{T_i} = 0$ ($T_i = \infty$) for all initial scores until we can guaranty that $\Psi^C > 0$. ■

Proof of Proposition 5:

For simplifying the notation we will prove the results using continuous distribution of signals. Then consider two signals $F_1(s|e)$ and $F_2(s|e)$ that we want to rank according to their informativeness. Jewitt (2007) shows the equivalence of Lehmann efficiency and Blackwell sufficiency in a dichotomous setting as ours, $e \in \{\underline{e}, \overline{e}\}$ in which signals satisfy MLRP. Lehmann criterion establish that a signal F_1 is more informative than another F_2 if, the following condition over quantiles holds:

$$\forall p \in [0,1], \quad F_1\left(F_1^{-1}(p|\underline{e})|\overline{e}\right) \leq F_2\left(F_2^{-1}(p|\underline{e})|\overline{e}\right). \tag{6}$$

By definition, the c.d.f.s $F_1(x|e)$ and $F_2(x|e)$ are nondecreasing functions, so that

$$\forall x,\ F_1(x|e) \geq F_2(x|e) \iff \forall p,\ F_1^{-1}(p|e) \leq F_2^{-1}(p|e).$$

By definition 1, $F_1(x|\underline{e}) \geq F_2(x|\underline{e})$ and hence, for any p,

$$\begin{aligned} F_1^{-1}(p|\underline{e}) &\leq F_2^{-1}(p|\underline{e}) \Rightarrow \\ F_2(F_1^{-1}(p|\underline{e})|\overline{e}) &\leq F_2(F_2^{-1}(p|\underline{e})|\overline{e}) \end{aligned}$$

By definition 1, $F_1(x|\overline{e}) \leq F_2(x|\overline{e})$, then replacing $F_2(F_1^{-1}(p|\underline{e})|\overline{e})$ by $F_1(F_1^{-1}(p|\underline{e})|\overline{e})$ then, we obtain

$$F_1(F_1^{-1}(p|\underline{e})|\overline{e}) \leq F_2(F_2^{-1}(p|\underline{e})|\overline{e}).$$

Then, our criterion of informativeness captured by definition 1 implies Lehmann efficiency and using Jewitt's result also Blackwell sufficiency. ■

Proof of Proposition 6: Let $\sum_{i=1}^{N} \Pr_1(s_i|\overline{e})\delta^{T_1^*(s_i)}$ and $\sum_{i=1}^{N} \Pr_2(s_i|\overline{e})\delta^{T_2^*(s_i)}$ be the optimal punishment under C_1 and C_2.First, we show that $T_2^*(s_i)$ is feasible under C_1.

$$\Psi^{C_1}(T_2^*(s_i), \Pr(s|\underline{e})_1, \Pr(s_i|\overline{e})_1) \geq \Psi^{C_2}(T_2^*(s_i), \Pr(s|\underline{e})_2, \Pr(s_i|\overline{e})_2)$$

This is due to the following facts: i) Ψ^C increases with $\sum \Pr(s_i|\overline{e})\delta^{T(s_i)}$ and decreases with $\sum \Pr(s_i|\underline{e})\delta^{T(s_i)}$. ii) $\delta^{T(s_i)}$ is an increasing function of s_i. iii) Scoring distributions are ordered according to the first order stochastic dominance, ($\sum_{i=1}^{x} \Pr(s_i|\overline{e})_1 \leq \sum_{i=1}^{x} \Pr(s_i|\overline{e})_2 \, \nabla x$) and ($\sum_{i=1}^{x} \Pr(s_i|\underline{e})_1 \geq \sum_{i=1}^{x} \Pr(s_i|\underline{e})_2 \, \nabla x$). Then, by ii) and iii) $\sum_{i=1}^{N} \Pr(s_i|\overline{e})_1\delta^{T_2^*(s_i)} > \sum_{i=1}^{N} \Pr(s_i|\overline{e})_2\delta^{T_2^*(s_i)}$ and $\sum_{i=1}^{N} \Pr(s_i|\underline{e})_1\delta^{T_2^*(s_i)} < \sum_{i=1}^{N} \Pr(s_i|\underline{e})_2\delta^{T_2^*(s_i)}$ which jointly with i) implies the inequality above. Finally, as $T_2^*(s_i)$ is feasible under C_1, we can state that

$$V^{C_1+}(\sum_{i=1}^{N} \Pr(s_i|\overline{e})_1\delta^{T_1^*(s_i)}) > V^{C_1+}(\sum_{i=1}^{N} \Pr(s_i|\overline{e})_1\delta^{T_2^*(s_i)}) > V^{C_2+}(\sum_{i=1}^{N} \Pr(s_i|\overline{e})_2\delta^{T_2^*(s_i)})$$

This is because, V^{C+}, the value the relationship between PF and CF is increasing in $\sum \Pr(s_i|\overline{e})\delta^{T(s_i)}$, and $\sum_{i=1}^{N} \Pr(s_i|\overline{e})_1\delta^{T_2^*(s_i)}) > \sum_{i=1}^{N} \Pr(s_i|\overline{e})_2\delta^{T_2^*(s_i)}$.which implies the last two inequalities. The first inequality is implied by the fact that for C_1, the optimal punishment is $T_1^*(s_i)$. ■

Proof of Proposition 7: The optimal relational punishment $(T_P^{WE*}, T_{NP}^{WE*})$ is given by the following equality

$$\Psi^{WE}(T_P^{WE*}, T_{NP}^{WE*}, \alpha, \beta, \gamma) = c$$

Following the arguments of the proof of Proposition 1 we can rewrite this equality as follows:

$$\frac{\delta\left[\pi(1-U^*) + (\alpha-\beta)\left(\frac{\delta^{T_P^{WE*}}}{1-\alpha} - \frac{U^*}{1-\alpha}\right)\right]}{1-\pi\delta-(1-\pi)\delta U^*} = \frac{c-d\gamma}{P-c-a\gamma}$$

Where, as in Proposition 1, $U^* = \alpha\delta^{T_P^{WE*}} + (1-\alpha)\delta^{T_{NP}^{WE*}}$ refers to the optimal relational punishment, and $d = (1-\beta)D - (1-\pi)(1-\alpha)D$ and $a = (1-\pi)(1-\alpha)D$ are two constants. For Proposition 1 we know that the left hand side of the equality is decreasing in U^*, then the lower is the right hand side, the higher is $U^* = \alpha\delta^{T_P^{WE*}} + (1-\alpha)\delta^{T_{NP}^{WE*}}$, and lower is the optimal relational punishment.

If we derive $\frac{c-d\gamma}{P-c-a\gamma}$ with respect to γ

$$\frac{d}{d\gamma}\left(\frac{c-d\gamma}{P-c-a\gamma}\right)=\frac{-d(P-c-a\gamma)+a(c-d\gamma)}{(P-c-a\gamma)^2}$$

This derivative is negative is

$$-d(P-c)+ac<0\Leftrightarrow\frac{c}{d}<\frac{(P-c)}{a}$$

This inequality is satisfied since we are assuming that i) $d=(1-\beta)D-(1-\pi)(1-\alpha)D>c\Rightarrow\frac{c}{d}<1$ and ii) $a=(1-\pi)(1-\alpha)D<P-c\Rightarrow\frac{(P-c)}{a}>1$. Then, the right hand side is decreasing in γ, and we can conclude that the optimal relational punishment (T_P^{WE*},T_{NP}^{WE*}) is decreasing in degree of enforceability of the formal contract γ. ■

Proof of Proposition 8: Immediate from the arguments in the main text. ■

Proof of Proposition 9: Immediate from the arguments in the main text. ■

References

[1] Baker, G., Gibbons, R. and K. J. Murphy. (1994) "Subjective Performance Measures in Optimal Incentive Contracts", Quarterly Journal of Economics, 109, 1125-1156.

[2] Baker, G., Gibbons, R. and K. J. Murphy. (2002) "Relational Contracts and the Theory of the Firm", Quarterly Journal of Economics, 117, 39-83.

[3] Baker, G., Gibbons, R. and K. J. Murphy. (2011) "Relational Adaptation", Mimeo.

[4] Baker, G., and T. Hubbard. (2004) "Contractibility and Asset Ownership: On-Board Computers and Governance in S.S. Trucking", Quarterly Journal of Economics, 119, 1443-1479.

[5] Baker, S. and A. Choi. (2014) "Contract's Role in Relational Contract", Mimeo.

[6] Bernstein, L. (1992) "Opting Out of the Legal System: Extralegal Contractual Relations in the Diamond Industry," Journal of Legal Studies, 21, 115-.

[7] Bernstein, L. (2001) "Private Commercial Law in the Cotton Industry: Creating Cooperation Through Rules, Norms, and Institutions," Michigan Law Review, 99, 1724-.

[8] Bozovic, I. and G. K. Hadfield. (2013) "Scaffolding: Using Formal Contracts to Build Informal Relations in Support of Innovation", Mimeo.

[9] Ganuza, J-J., F. Gomez and M. Robles (2015) “Product Liability versus Reputation”, forthcoming in Journal of Law, Economics and Organization.

[10] Gil, R. and G. Zanarone. (2014) ”Testing for the Interaction of Formal and Informal Contracts”, Mimeo.

[11] Gilson, R. J., C. F. Sabel, and R. E. Scott. (2009) ”Contracting for Innovation: Vertical Disintegration and Interfirm Collaboration”, Columbia Law Review, 109, 431-502.

[12] Gilson, R. J., C. F. Sabel, and R. E. Scott. (2010) ”Braiding: The Interaction of Formal and Informal Contracting in Theory, Practice and Doctrine”, Columbia Law Review, 110, 1377-1447.

[13] Gilson, R. J., C. F. Sabel, and R. E. Scott. (2009) ”Contract and Innovation: The Limited Role of Generalist Courts in the Evolution of Novel Contractual Forms”, New York University Law Review, 88, 170-215.

[14] Green, E. and R. Porter. (1984) ”Noncooperative Collusion Under Imperfect Price Information”, Econometrica, 52, 87-100.

[15] Greif, A. (1989), ”Reputation and Coalitions in Medieval Trade: Evidence on the Maghribi Traders”, The Journal of Economic History 49, 857-882.

[16] Greif, A. (2012), ”The Maghribi Traders: A Reappraisal?”, The Economic History Review, 65, 445-469.

[17] Hermalin, B. (2002), ”Adverse Selection, Short-Term Contracting and the Underprovision of On-the-Job Training”, Contributions to Economic Analysis and Policy, 1, Article 5.

[18] Jewitt, I. (2007), “Information Order in Decision and Agency Problems”, mimeo.

[19] Klein, B. and K. B. Leffler (1981) The role of Market Forces in Assuring Contractual Performance”, Journal of Political Economy, 89, 615-641.

[20] Macaulay, S. (1963), ”Non-Contractual Relations in Business: A Preliminary Study”, American Sociological Review, 28, 55-67.

[21] MacLeod, B. (2007), ”Reputations, Relationships and Contract Enforcement.”, Journal of Economic Literature, 45, 595-628.

[22] Malcomson, J. M. (2012), "Relational Incentive Contracts", in Gibbons, R. and J. Roberts, The Handbook of Organizational Economics, Princeton University Press, 1014-1065.

[23] Milgrom, P. (1981) "Good News and Bad News: Representation Theorems and Applications", Bell Journal of Economics, 12, 380-391.

[24] Schmidt, K. M., and M. Schnitzer. (1995), "The interaction of explicit and implicit contracts", Economics Letters, 48, 193-199.

[25] Sobel, J. (2006), "For better or forever: Formal versus informal enforcement", Journal of Labor Economics, 24, 271-297.

[26] Spier, K. (1992) "Incomplete Contracts and Signalling", RAND Journal of Economics, 23, 432-443.