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The relational underpinnings of formal contracting and the welfare consequences of legal system improvement

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ABSTRACT

We consider how parties' formal contracts are underpinned by their ongoing relationship and how welfare changes as the legal system improves. Regardless of impatience, the parties write formal contracts that they would not honor – despite stipulated penalties – if they interacted only once. The change in welfare with an improvement in the legal system can be ambiguous and even non-monotonic.

1. Introduction

Evidence from bankruptcies suggests that there is a tendency for firms to breach their formal (written) contracts when their bilateral relationship suddenly seems at an end (see, *e.g.*, Triantis, 1993). This suggests that contracts are honored not only because of the contractually stipulated damages, but also because of the effect of breach on the ongoing relationship.[1] As we show, an ongoing relationship permits parties to write formal contracts that would not be worth the paper on which they were written absent the relationship.[2] Moreover, we find that no matter how impatient the parties are, they always write contracts they would fail to honor if they interacted only once.[3]

We also provide a framework to study how an improving legal system affects welfare. Our analysis offers a more nuanced assessment of the issue than the previous literature: improving formal contracting (*i.e.*, contracts enforced by courts) can be welfare reducing or enhancing; moreover, welfare need not vary monotonically with improvements in the legal system.[4]

2. Model

2.1. Basic assumptions

There are two parties. In each period, they agree to a contract for that period, each party then chooses an action, $q \in \mathbb{R}_+$, and, finally, payoffs are realized.

Let party i's payoff be $\beta(q_1, q_2) - c(q_i)$, where benefit $\beta : \mathbb{R}^2_+ \to \mathbb{R}$ and cost $c : \mathbb{R}_+ \to \mathbb{R}_+$ are both twice continuously differentiable. Assume:

- Marginal cost is increasing in action (*i.e.*, $c''(\cdot) > 0$). To ensure interior maxima, assume $c'(0) = 0$.

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1 Macaulay (1963) suggested that informal ties between parties could strengthen their formal contracting, although he did not explore this via an economic model.

2 A few articles (*e.g.*, Sobel, 2006; Battigalli and Maggi, 2008; and Kvaløy and Olsen, 2009) study how an ongoing relationship affects the cost of establishing formal contracts. Here, in contrast, we assume the use of formal contracts is costless.

3 There is evidence (Paley, 1984) that firms write contracts that they would find difficult to enforce in court (in Paley's study, the contracts were inconsistent with existing regulations).

4 Schmidt and Schnitzer (1995) present a model in which improved formal contracting is welfare *reducing* because it undermines relational contracts. Other relevant articles in that vein include Kranton (1996), Kranton and Swamy (1999), and McMillan and Woodruff (1999a,b). Like us, Baker et al. (1994) show that improved formal contracting can have ambiguous effects on the ability to sustain relational contracting. As discussed below, their result arises for different reasons than here.

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- The benefit of no actions is normalized to zero (*i.e.*, $\beta(0,0)=0$).
- On some margins, at least, benefit increases in action: $\partial\beta(q_i,q_j)/\partial q_i>0$ whenever $q_i\le q_j$.

To keep matters straightforward, we assume a very symmetric setting: $\beta(q,q')=\beta(q',q)$ and symmetry of action is desirable, that is, $q_1+q_2=q_1'+q_2'$ and $|q_1-q_2|>|q_1'-q_2'|$ imply $\beta(q_1,q_2)\le\beta(q_1',q_2')$.[5] Two *examples*: $\beta(q_1,q_2)=f(q_1)+f(q_2)$, $f(\cdot)$ concave, and

$$\beta(q_1,q_2)=(q_1+q_2)^{3/2}+\exp\big(-(q_1-q_2)^2\big).$$

Note the latter is not a concave function.

Assume a positive and finite value q_M such that

$$2\frac{\partial\beta(q,q)}{\partial q}-c'(q)<0 \tag{1}$$

for all $q>q_M$. Consequently, the parties always wish to choose a finite action.

Assume the two parties are the "only game in town", insofar as neither can trade with a third party. A relational breakdown is, thus, *not* punished by terminating the relationship, but by reversion to the equilibrium of the one-shot contracting game.[6]

2.2. The legal system

A contract specifies the parties' actions. Party i has breached contract $\langle\bar q_1,\bar q_2\rangle$ if $q_i<\bar q_i$.[7] The legal system is imperfect: in the event of breach, a court awards damages to the injured party with probability $\theta\in[0,1)$ only. Note $\theta=0$ is equivalent to no court system and greater values of θ represent better legal systems. The parameter θ is common knowledge at the time of contracting.

In keeping with the law's abhorrence of penalties in private contracts (see *e.g.*, Hermalin et al., 2007, Section 5.3), assume damages, D, cannot exceed the actual loss suffered; hence,

$$D\le\beta(\bar q_1,\bar q_2)-\beta(q_i,\bar q_j). \tag{2}$$

The courts will dismiss greater damage claims as punitive (consistent with practice in many legal systems).[8]

In equilibrium, the parties honor their contract. It is, therefore, without loss to assume the parties seek maximum deterrence: (2) binds. The expected payoffs to the breaching party (without loss of generality, 1) and to the injured party (here, 2) are, respectively,

$$\Pi_1=(\theta+1)\beta(q_1,\bar q_2)-\theta\beta(\bar q_1,\bar q_2)-c(q_1)\quad\text{and} \tag{3}$$
$$\Pi_2=(1-\theta)\beta(q_1,\bar q_2)+\theta\beta(\bar q_1,\bar q_2)-c(\bar q_2).$$

3. First best and the one-shot game

The following lemma is critical to the subsequent analysis.[9]

Lemma 1. *For*

$$\zeta\beta(q_1,q_2)-c(q_1)-c(q_2), \tag{4}$$

$\zeta\in(0,2]$, *the following hold:*

(i) *If* $q_1'+q_2'=q_1''+q_2''$, *but* $|q_1'-q_2'|>|q_1''-q_2''|$, *then* (4) *is greater given* (q_1'',q_2'') *than given* (q_1',q_2').
(ii) *There exists a finite action,* $q^*(\zeta)$, *such that* (4) *is maximized if each party chooses it.*
(iii) $\zeta>\zeta'$ *implies* $q^*(\zeta)>q^*(\zeta')$.
(iv) *Holding one party's action fixed, a finite action exists for the other that maximizes* (4).
(v) *The action in part* (iv) *is increasing in* ζ.

Joint payoffs are

$$\beta(q_1,q_2)-c(q_1)+\beta(q_1,q_2)-c(q_2)$$
$$=2\beta(q_1,q_2)-c(q_1)-c(q_2). \tag{5}$$

From the lemma, there exists a finite $q^*(2)$ that, if each party chooses it, maximizes joint payoffs.

Define

$$q^{\mathrm{BR}}(q,\zeta)=\underset{x}{\operatorname{argmax}}\,\zeta\beta(x,q)-c(x). \tag{6}$$

Lemma 2. $q^{\mathrm{BR}}\big(q^*(\zeta),\zeta\big)=q^*(\zeta)$.

Lemma 2 implies that a Nash equilibrium of the game played once, absent any contract, is for both parties to choose $q^*(1)$.

If party i will honor the contract $\langle\bar q_i,\bar q_j\rangle$, then

$$\beta(\bar q_i,\bar q_j)-c(\bar q_i)\ge\max_q(\theta+1)\beta(q,\bar q_j)-\theta\beta(\bar q_i,\bar q_j)-c(q), \tag{7}$$

where the right-hand side (RHS) follows from (3). Observe

$$(\theta+1)\beta(\bar q_i,\bar q_j)-c(\bar q_i)\ge\max_q(\theta+1)\beta(q,\bar q_j)-c(q) \tag{8}$$

is equivalent to (7); hence, we have the following.

Lemma 3. *A contract* $\langle\bar q_i,\bar q_2\rangle$ *will be honored in equilibrium only if* $\bar q_i=q^{\mathrm{BR}}(\bar q_j,\theta+1)$ *and* $\bar q_j=q^{\mathrm{BR}}(\bar q_i,\theta+1)$.

Although not essential, it speeds the analysis if $q^*(\zeta)$ is unique $\forall\zeta\in[1,2]$.

Assumption 1. The univariate function $\mathbb{R}_+\to\mathbb{R}$ defined by $q\mapsto\zeta\beta(q,q)-2c(q)$ is a strictly concave function (of q) for all $\zeta\in[1,2]$.

We can now establish:

Proposition 1. *If the quality of the legal system is* θ, $\theta\in[0,1)$, *then the only* formal *contract that will be honored as a pure-strategy equilibrium in the one-shot game is one that has each party play* $q^*(\theta+1)$.

Proposition 1 has a few implications. Given Lemma 1(v), it implies that the better is the legal system, the greater will be the equilibrium action. Second, if the court has minimum quality or is non-existent (*i.e.*, $\theta=0$), then the outcome is identical to one in which no contract is written. Third, a perfect court (*i.e.*, $\theta=1$) results in the first-best outcome. Finally, given Assumption 1, the closer $q^*(\theta+1)$ is to $q^*(2)$, the greater is welfare: absent repeated play, a better legal system enhances welfare.

4. The repeated game

Consider an infinitely repeated game. Let $\delta\in(0,1)$ denote the common discount factor. In what follows, the parties will write a contract $\langle\hat q,\hat q\rangle$ that is better than the one-shot (Proposition 1) contract, that is, $\hat q\in\big(q^*(\theta+1),q^*(2)\big]$. Such a contract is supported by both the penalty for breach and the threat of reversion to the equilibrium of the one-shot game. Let

$$\pi_{\mathrm{ONE}}(\theta)\equiv\beta\big(q^*(\theta+1),q^*(\theta+1)\big)-c\big(q^*(\theta+1)\big)$$

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5 Formally, the function β is Schur concave.

6 The analysis can be extended to allow the parties to terminate their relationship and search for new partners: if (i) reputation is public; or (ii) a newly partnerless party is mistrusted, so limited to playing the one-shot equilibrium with new partners. In either alternative interpretation, the breaching party's continuation payoffs considered below would simply be the payoffs from contracts it signs with a new partner (or partners).

7 The possibility of "breach" in which $q_i>\bar q_i$ can be ignored: in equilibrium, the parties do not write contracts that give incentives to "over" do it.

8 Similar results would attain if there were no limits on damages, but the breacher could escape overly large damages via bankruptcy.

9 As true of most results, the proof is in the Appendix.