A Model of Negotiation, Not Bargaining

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Abstract

Bargaining models ask how a surplus is split between two parties in bilateral monopoly. Much of real-world negotiation involves complications to the original split which may or may not increase the welfare of both parties. The parties must decide which complications to propose, how closely to examine the other side's proposals, and when to accept them. This type of negotiation raises welfare, rather than reducing it. This paper models negotiation as a two-period auditing game, and find a variety of plausible equilibria, some of which can be pareto-ranked. Expectations are highly important, and precommitment can increase welfare substantially.

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1. INTRODUCTION

Ordinary people often have difficulty appreciating the idea of gains from trade in a competitive market. If one person sells and the other person buys, they think, it must be that one of them has gained a victory over the other; every transaction has a winner and a loser. One of the central ideas in economics is that this is not true, and in competitive markets, or even monopolized markets, one cannot really speak of a winner and a loser. Both sides benefit.

When it comes to bilateral monopoly or bargaining, however, the emphasis is different, even for professional economists. The standard paradigm is the splitting of a pie, whether the model uses cooperative game theory, as in Nash (1950); noncooperative game theory with complete information, as in Rubinstein (1982); or noncooperative game theory with incomplete information, as in the vast literature surved in Kennan & Wilson (1993), of which Cramton (1984) is a typical example.

Both bargainers will gain from the split, because if they fail to agree, the entire pie is lost, and in this sense there are gains from trade. Each person's bargaining effort, however, is devoted to trying to increase his own share at the expense of the other, and in this other sense there is a winner and loser.

To the extent that agreement is not immediately reached, such pie-splitting is socially wasteful. Bargaining is redistributive, not productive; a process of rent-seeking, not value creation. The lesson for policy seems to be that institutions should be designed to eliminate bargaining. In this view, salesmen, brokers, and lawyers may be useful to initiate transactions, but time spent on negotiations is time wasted.

One contribution of the incomplete information models of bargaining is to show that bargaining is not quite so useless as this. Without bargaining, it may be unclear whether the pie actually exists: if the seller values an object more than the buyer, then the trade should not take place, and the bargaining process may be useful to reveal this. Even if it is common knowledge that the buyer values the object more than the seller, however, costly bargaining will still take place and agreement will sometimes fail to be reached.[1]

Much dealmaking, however, does not fit into even the extended paradigm of splitting a pie of uncertain size, because the process of coming to an agreement is

[1] See Kennan & Wilson, p. 67 for a numerical example of costly bargaining when both parties know there exist gains from trade.

not so much about setting a price as about setting the terms of the agreement. This is especially true about deal-making's most time-consuming aspects, which are not repetitions of "I want a higher price" and "I want a lower price," but complicated suggestions and amendments, preceded and succeeded by careful investigation of their implications. I will call this process *negotiation*, in contrast to *bargaining*.

Example abound. If I wish to build a house, and I negotiate with the contractor, we do not just talk about the price; and our talk about the details of the contract is not just redistributive. We could eliminate a huge amount of negotiation if the government required that the house be of a single standard design, but that would not be efficient. I have my particular preferences about the windows, woodwork, floor type, color, and time of completion, and the contractor has his own individual costs for each feature. Much of my concern will not be about whether I can extract a good price at the expense of the contractor, but whether I am agreeing to buy features of the house that I really want. If I ask the contractor to paint the house purple, and I find later I do not like a purple house, it is no consolation that he made no profit off the paint.

Labor contracting is dominated by negotiation.

It may be that a union and an employer have agreed upon a wage, but that does not end the collective bargaining. The employer may also, for example, offer an extension to the health insurance benefits, in exchange for a wage concession. Possibly, the benefit to the union is greater than the lost wages, in which case the change would benefit both sides. Or, maybe the workers could do better by not accepting the new insurance. The union negotiator's uncertainty is not over the minimum offer that the company will accept, but over whether the health insurance helps both sides.

Mergers and acquisitions are notoriously complicated deals. Suppose that company A is selling off a division to company B. They have agreed on a price, which both of them would be willing to accept, but now company A asks that a clause be added to the deal under which it would buy back a certain amount of the output of the division each year at a specified price. The clause might benefit company B, or might hurt it. Again, the uncertainty is not over the minimum that company A would accept, but over whether the contract benefits both sides or not.

It may be quite clear that the clause benefits company A by exactly five million

dollars, but it may be unclear what the cost of the clause is to company B.

On a less grand level, suppose that Mr. Smith is selling a load of lumber to Mr. Jones. The deal has been made, but then Smith says, "Throw in an extra $50.00 and I'll deliver the lumber to your house. It's no big deal for me, and you'll save a lot of effort." Jones's uncertainty is not over the cost of delivery to Smith, which is of no interest to him. Rather, it is over the cost to himself, which might be either the cost of his own effort or the cost of hiring a deliveryman.This cost might be $80.00, in which case Smith is right that both parties would benefit from the proposal, or it might be $30.00, in which case Smith gains but Jones loses, and, furthermore, the proposal is inefficient.

All four of these examples involve the conflict between *creating value* and *claiming value* which is emphasized in the informal literature on bargaining (a survey of which can be found in Sebenius (1992)). Bargaining theorists in economics think of negotiation as multi-attribute bargaining: the splitting of several pies simultaneously rather than the splitting of just one pie, but essentially the same problem. In incomplete information models, bargaining over several attributes is similar to bargaining over one attribute because the strategic problem is the same: When player *A* proposes a contract modification to player *B*, how can *B* determine the value of that modification to *A*? It may indeed be that expectations and signalling make it quite significant that the surplus to be split is first separated into two pies instead of one, because, as Bac & Raff (1994) show, a bargainer may convey information about himself by which pie he concentrates his efforts upon. But the idea of creating value is different.

This difference has been recognized but not modelled. At the start of their survey of bargaining models, John Kennan and Robert Wilson list three costs of bargaining:

> "Costly delays and failures to agree when gains from trade exist represent two kinds of inefficiencies; a third is that an agreement is inefficient if its terms fail to realize all the potential gains from trade, as in the case that a firm's contract with a union specifies inefficient work rules or numbers of workers."[2]

Kennan and Wilson go on to survey the bargaining literature at length, but while costly delays and failures to agree receive ample attention in the next fifty-eight pages, failure to realize all the potential gains from trade does not resurface.

[2]Kennan & Wilson (1993, p. 46.

This neglect of negotiation can be explained, perhaps, because it requires a different style of model.

The approach I will use below is not the standard bargaining approach of cooperative game theory or of incomplete information games. Instead, I use an auditing model, in which information is complete but one player takes an action which the other player can either audit or let pass. The two players have completed their basic bargain, and are negotiating on possible extra clauses to add to the contract. The extra clauses might benefit both players, creating value, or just the proposer, claiming value under the pretence of creating value. The other player must decide whether to trust the offer or inspect it carefully. It will be costly both to propose and to inspect clauses, so this will be a model of both the *contract-writing costs* which are already well-known, and of *contract-reading costs*, which are perhaps much larger. The strategic problem is different now: When player *A* proposes a contract modification to player *B*, how can *B* determine the value of that modification to *B* himself?

The auditing literature is completely distinct from the bargaining literature. One strand of the literature, which began with Baiman & Demski (1980) examine the incentives for high effort by a worker whose income is observed and can be used as the basis for an audit investigation. Another strand, which began with Townsend (1979), investigates the mechanism design question of how a provider of capital can elicit truthful reports of the financial condition of the user of capital. Since the problem is one of mechanism design, the players can contract in advance as to penalties for lying and bonuses for telling the truth.[3] Neither of these types of models is quite suitable for modelling negotiation, since there is no variable equivalent to income which could be used as the basis for an audit and there is usually no advance contracting about penalties for lying.

The closest model to the one in this paper is Katz (1990). Katz is not concerned with negotiation *per se*, but with the legal rules involving the fine print in contracts. The courts must decide how much of the fine print in contracts to enforce. If they enforce none of it, they must pecify how the contract binds the parties, since the writing in the contract itself has been abandoned. If they enforce all of it, the each party tothe contract must read its terms carefully or abandon writing detailed contracts in favor of short but ambiguous ones which leave much to legal default rules and the courts. Contract-reading costs are important, but the

[3]Townsend (1979) does not consider the use of random auditing strategies, an important omission corrected by Border & Sobel (1987) and
Mookherjee & Png (1989).

legal rules should be designed to induce the parties to monitor what each inserts into the contract.

Section 2 of the present paper will construct the model of negotiation without solving for the equilibrium. Sections 3 and 4 will find the equilibria in the simple cases when precommitment is possible— in Section 3, when a player can precommit to honesty; and in Section 4, when he can precommit to inspecting all clauses carefully. Section 5 contains the bulk of the analysis, setting out the six possible equilibria and showing why four of them are plausible. Section 6 summarizes the results and draws general lessons.

2. THE MODEL

Two parties, the Offerer and the Accepter, are trying to agree on the details of a contract. They have already agreed to a basic contract, splitting a surplus 50-50. This basic contract will not affect the model, and, indeed, it is included only to emphasize that some parts of the deal may not require negotiation. Let us say that the original deal generates a surplus of $2\overline{\pi}$, where $\overline{\pi}$ could equal zero, and let us assume that the surplus is split equally between the two players by the bargaining process. We will denote the per-round expected payoffs of the subgame starting with the offer of a new clause by $\pi_{1o}, \pi_{1a}, \pi_{2o}$, and π_{2a} .

A sincere clause yields the Offerer x_s if accepted, and a misleading one yields him x_m. The cost to him of making an offer is $c_s > 0$ or $c_m > 0$, depending on the type of clause, where either of these might be the greater cost, depending on whether it is more costly to discover and propose a mutually beneficial sincere clause or to disguise a one-sided clause so that it is misleading. Assume that

$$x_m - c_m > x_s - c_s > 0. \tag{1}$$

The first inequality in (1) says that the Offerer would prefer a misleading clause to a sincere one, given the cost of offering them, if both clauses had equal probabilities of acceptance. the second inequality says that either type of clause helps the Offerer, if accepted.

The Accepter's benefit is $y_s > 0$ from a sincere clause and $-y_m < 0$ from a misleading one. He cannot costlessly identify a clause that is offered. Instead, he can accept it outright, reject it, or inspect it at cost c_i and discover whether it is sincere or misleading.

The order of play is thus

(0) Offerer and Accepter split the surplus of $2\overline{\pi}$ equally.

(1a) The first round of offers occurs. The Offerer offers a sincere clause at cost c_s, or a misleading clause at cost c_m, or ends the game by making no offer at all.

(1b) The Accepter inspects the clause at cost c_i, discovering whether it is sincere or misleading, or does not inspect.

(1c) The Accepter accepts or rejects the clause.

(2a) The second round of offers occurs. The Offerer offers a sincere clause at cost c_s, or a misleading clause at cost c_m, or ends the game by making no offer at all.

(2b) The Accepter inspects the second clause at cost c_i, discovering whether it is sincere or misleading, or does not inspect.

(2c) The Accepter accepts or rejects the second clause.

(3) The contract is finalized, payoffs are received, and the effect of the clauses is discovered.

The Offerer has the option of not offering any clause at all, for a payoff of 0.

Please note that this is a game of complete information. There do not exist different "types" of Offerers, and there is nothing for the Accepter to learn about the Offerer during the game, although the Accepter can learn about the Offerer's choice of clause. Because of this , it would make very little difference if the two players switched roles in mid-game, so that one player was the Offerer in the first round and the other was the Offerer in the second round. The properties of the game would be essentially unchanged; each of the possible equilibrium outcomes described below would continue to exist.

3.
THE VALUE OF A REPUTATION FOR HONESTY: WHAT IF THE OFFERER CAN PRECOMMIT?

What happens if the Offerer can precommit to offer only sincere clauses? The Accepter will then not bother to inspect, and will accept both clauses, so the payoffs in each round are

$$\pi_o = x_s - c_s \tag{2}$$

and

$$\pi_a = y_s, \tag{3}$$

for a total social surplus over the two rounds of

$$\pi_{1o} + \pi_{1a} + \pi_{2o} + \pi_{2a} = 2(x_s + y_s - c_s). \tag{4}$$

The social surpluses in this and the scenarios below are tabulated later in Table 1 for comparison. The social surplus in this scenario is the highest possible, because reading contracts carefully is unnecessary and the sincere clauses are always offered.

It is hard to see how someone could literally commit to offering only sincere clauses, but in some cases plausible ways to reach the same outcome are available. If the Offerer repeatedly negotiates over time, with one or different Accepters, he may wish to preserve a reputation for sincerity. If he ever offered a misleading contract, it would be accepted, but if he tried to enforce it, he could lose his reputation. Or, it might be possible to include in the contract a provision that if the Accepter thinks a clause is misleading, a court or an impartial arbitrator with a reputation for honesty can void the contract. In practice, of course, it may be difficult for an outsider to determine whether a clause is misleading.

4.
THE VALUE OF A REPUTATION FOR READING CONTRACTS CAREFULLY: WHAT IF THE ACCEPTER CAN PRECOMMIT?

What happens if the Accepter can precommit to inspect? The Offerer is then willing to offer two sincere clauses, and the payoffs in each round are

$$\pi_o = x_s - c_s \tag{5}$$

and

$$\pi_a = y_s - c_i, \tag{6}$$

for a total social surplus over the two rounds of

$$\pi_{1o} + \pi_{1a} + \pi_{2o} + \pi_{2a} = 2(x_s + y_s - c_s - c_i). \tag{7}$$

The Accepter is willing to precommit to inspection without any sort of side payment if $y_s - c_i \geq 0$.

The Accepter may be able to do even better, however.[4] Suppose he can precommit to inspect with auditing probability α; e.g., he precommits to inspect with a probability of 90 percent.

This is cheaper in expected value than the probability of 100 percent used above, and might still deter the Offerer from attempting to sneak by a misleading clause. It will deter him if α is chosen so that

$$\pi_o(\textit{Sincere}) = x_s - c_s \geq \pi_o(\textit{Misleading}) = (1 - \alpha)x_m + \alpha(0) - c_m, \tag{8}$$

which requires that

$$\alpha \geq \frac{(x_m - c_m) - (x_s - c_s)}{x_m}. \tag{9}$$

Assumption (1) ensures that the right-hand side of (e0h) is between zero and one.

If α is set at α^*, the cheapest level which makes inequality (9) true, then the payoffs in each round are

$$\pi_o = x_s - c_s \tag{10}$$

and

$$\pi_a = y_s - \left(\frac{x_s - c_s + c_m}{x_m}\right) c_i, \tag{11}$$

[4] I thank Wolfgang Pesendorfer for pointing this out to me.

for a total social surplus over the two rounds of

$$\pi_{1o} + \pi_{1a} + \pi_{2o} + \pi_{2a} = 2(x_s + y_s - c_s - \left(\frac{x_s - c_s + c_m}{x_m}\right) c_i). \qquad (12)$$

The use of a probability α does not imply that the equilibrium is in mixed strategies; something quite different is going on here. Precommitment to an auditing probability is distinct from a mixed strategy, because the Accepter must inspect with positive probability even though he knows that in equilibrium the Offerer will never offer a misleading clause.[5] Without precommitment, if the Accepter announced he was following the strategy just described, it would not be an equilibrium. If the Offerer believed the announcement and only offered sincere clauses, the Accepter would change his mind and reset the inspection probability to zero when the time came to pay the inspection cost.

Precommitment might take the form of paying for contract inspection in advance of the negotiation, by hiring an in-house lawyer, for example, and being careful to not have other uses for his time. An interesting alternative that would reach the same result would be for the Offerer to pay for the lawyer, bundling together the offer of a new clause and the inspecting of the clause. "He who pays the piper calls the tune," however, and such an arrangement might not be trusted by the Accepter.

The usual substitute for precommitment, reputation, might not work. The reputation here would be a reputation for reading contracts carefully. If the Accepter can show Offerers that he does read contracts carefully, he can maintain such a reputation, but that may not be possible. Since only sincere clauses are offered in equilibrium, neither the diligent contract-reading Accepter nor the deviant non-reading Accepter would ever find a misleading contract. The problem of verifying that the Accepter is following his equilibrium behavior becomes especially acute when that behavior is to inspect with probability α less than one; in each negotiation round, the Accepter could fail to inspect, and claim that his failure was a matter of chance.

If the Accepter can somehow commit to inspect every offer, however, the social surplus is almost as high as when the Offerer can commit to offering sincere clauses. The only difference is the cost of inspection.

5. THE EQUILIBRIA WITHOUT PRECOMMITMENT

[5] For more on the distinction, see Rasmusen (1994), pp. 81-83.

Let us now assume that neither player can precommit to any action. The Offerer has free choice of clauses: he can offer two misleading clauses, two sincere ones, or one sincere and one misleading.

Any equilibrium must have the following properties:

(a) The Offerer does not offer a misleading clause with probability one. If he did, then the Accepter would never inspect or accept, and so the Offerer would incur cost c_m for no benefit.

(b) The Offerer does not offer a sincere clause with probability one. If he did, the Accepter would never inspect the clause, and so the Offerer would prefer to deviate to offering a misleading clause to obtain x_m instead of x_s.

(c) The Accepter does not have probability one of accepting without inspection. If he did, the Offerer would only offer misleading clauses.

(d) The Accepter does not have probability one of inspecting. If he did, the Offerer would never offer misleading clauses, making the inspection pointless.

These properties still leave a multiplicity of equilibria, depending on the expectations of the two players and the parameters of the model.

EQUILIBRIUM 1: Mixing Each Round.

Offerer: In each round, offer the sincere clause with probability p_s and the misleading clause with probability $1 - p_s$.

Accepter: In each round, accept without inspection with probability p_a and inspect with probability $1 - p_a$.

Let the probability with which the Offerer offers the sincere clause be p_s and the probability with which the Accepter accepts without inspection be p_a. The one-round payoffs to the Offerer are

$$\pi_o(\textit{sincere}) = -c_s + p_a x_s + (1 - p_a)x_s \tag{13}$$

and

$$\pi_o(\textit{misleading}) = -c_m + p_a x_m + (1 - p_a) \cdot 0, \tag{14}$$

since the misleading clause will be rejected if the Accepter chooses to inspect. If there is a mixed strategy equilibrium, the two pure-strategy payoffs must be equated, so

$$-c_s + p_a x_s + (1 - p_a)x_s = -c_m + p_a x_m, \tag{15}$$

and

$$p_a^* = \frac{x_s - c_s + c_m}{x_m}. \tag{16}$$

The one-round payoffs of the Accepter are

$$\pi_a(accept) = p_s y_s - (1 - p_s)y_m \tag{17}$$

and

$$\pi_a(inspect) = -c_i + p_s y_s - (1 - p_s) \cdot 0 \tag{18}$$

since the misleading clause will be rejected if the Accepter inspects it.

If there is a mixed strategy equilibrium, the two pure-strategy payoffs must be equated, so

$$p_s y_s - (1 - p_s)y_m = -c_i + p_s y_s, \tag{19}$$

and

$$p_s^* = 1 - \frac{c_i}{y_m}. \tag{20}$$

For the probabilities in (16) and (20) to remain between zero and one requires that

$$x_s - c_s + c_m \geq 0, \tag{21}$$

which is guaranteed by assumption (1), and

$$c_i \leq y_m. \tag{22}$$

If assumption (22) is false, Equilibrium 1 does not exist. If $c_i > y_m$, the Accepter is not willing to inspect in moves (1b) and (2b), even though such inspection is needed for the Offerer to be willing to offer a sincere clause.

In addition, the Accepter has the option of rejecting without inspection, for a payoff of 0. Comparing the payoff of 0 with the payoff in (18) from the pure strategy of inspecting $(-c_i+p_s y_s)$, it is apparent that for him to refrain from outright rejection requires that

$$p_s y_s \geq c_i, \tag{23}$$

or, substituting for the equilibrium level of p_s from (20),

$$\left(1 - \frac{c_i}{y_m}\right) y_s \geq c_i \tag{24}$$

If condition (24) is false, then equilibrium 1 does not exist. Note that condition (24) requires that $c_i \leq y_s$. Inspection must be cheap enough relative to the value of a sincere clause that the Acceptor is willing to undertake the amount of inspection needed to give the Offeror incentive to sometimes offer the sincere clause.

The equilibrium payoffs for the entire subgame are twice the per-round payoffs using the equilibrium mixing probabilities, so they equal, from (13),

$$\pi^*_{1o} + \pi^*_{2o} = 2(x_s - c_s) \tag{25}$$

and, from (18) and (20),

$$\pi^*_{1a} + \pi^*_{2a} = 2(y_s - c_i \left(1 + \frac{y_s}{y_m}\right)), \tag{26}$$

for a total social surplus of

$$\pi^*_{1o} + \pi^*_{2o} + \pi^*_{1a} + \pi^*_{2a} = 2(x_s + y_s - c_s - c_i - \frac{c_i y_s}{y_m}). \tag{27}$$

The surplus in (27) is less than the surplus when the Accepter can precommit to inspecting every offer.

EQUILIBRIUM 2: No Offers.

Offerer: Do not offer either clause.

Accepter: Reject any clause that is offered.

Out-of-equilibrium belief: If the Offerer deviates and offers a clause, the Accepter believes it is sincere with a probability β of no more than $Max\{\frac{y_s}{y_s+y_m}, \frac{c_i}{y_s}\}$.

Equilibrium 2 is an equilibrium because the Offerer has no incentive to offer clauses if the Accepter always rejects, and the Accepter has no incentive to inspect or accept given his beliefs. This dilemma is similar to the situation in some signalling and coordination games, but here unlike in those games (e.g., Cho & Kreps (1987) Van Damme (1989)), the intuitive criterion and forward induction have no bite.[6]

The out-of-equilibrium beliefs needed to sustain Equilibrium 2 are obtained as follows.

If β is the Accepter's subjective probability that the Offerer's out-of-equilibrium offer is of a sincere clause, then the Accepter's single-round subgame payoff is

$$\pi_a(accept) = \beta y_s - (1-\beta)y_m, \tag{28}$$

which yields us $\beta = \frac{y_s}{y_s+y_m}$ for the value of β which makes the Accepter prefer to reject and receive the payoff of 0.

It must also be true that the Accepter does not think it worthwhile to inspect. The payoff from inspecting, given the belief β, is

$$\pi_a(inspect) = \beta y_s - (1-\beta)(0) - c_i, \tag{29}$$

which gives us $\beta = \frac{c_i}{y_s}$ for the value of β which makes the Accepter prefer to reject and receive the payoff of 0.

The equilibrium payoffs are zero in each round in Equilibrium 2. Existence of Equilibrium 2, unlike existence of Equilibrium 1, requires no special assumptions beyond those made in setting up the model in Section 2.

EQUILIBRIUM 3: Just One Offer.

[6]One change to the model which could make a big difference is incomplete information. If even a small number of honest Offerers will never make misleading offers (i.e., $c_m = \infty$ for them), then Equilibrium 2 breaks down, because an offer observed out-of-equilibrium would have to be a sincere clause offered by one of these honest Offerers. Incomplete information, however, brings in other complications; if we also added a number of dishonest Offerers for whom $c_m = 0$, then the out-of-equilibrium offer might come from one of them, and Equilibrium 2 is revived.

Offerer: Offer a sincere clause in the first round with probability $p_s^* = 1 - \frac{c_i}{y_m}$. Do not offer a second clause.

Accepter: Accept the first clause with probability $p_a^* = \frac{x_s - c_s + c_m}{x_m}$. Reject the second clause if it is offered.

Out-of-equilibrium belief: If the Offerer offers a second clause, the Accepter believes it is sincere with a probability β of no more than $Max\{\frac{y_s}{y_s+y_m}, \frac{c_i}{y_s}\}$.

Equilibrium 3 is a combination of Equilibria 1 and 2, with different behavior in each round. Equilibrium payoffs are half those in Equilibrium 1. Assumptions (24) and (22) must be true for Equilibrium 3 to exist, for the same reasons as in Equilibrium 1.

EQUILIBRIUM 4: Customary Delay.

Offerer: Offer a sincere clause in the first round with probability of no more than $Max\{\frac{y_s}{y_s+y_m}, \frac{c_i}{y_s}\}$, and otherwise offer a misleading clause. Offer a sincere clause in the second round with probability $p_s^* = 1 - \frac{c_i}{y_m}$, and otherwise offer a misleading clause.

Accepter: Reject the first clause offered. Accept the second clause with probability $p_a^* = \frac{x_s - c_s + c_m}{x_m}$.

Equilibrium 3 is also a combination of Equilibria 1 and 2, with different behavior in each round, but here the equilibrium payoffs are less than half those in Equilibrium 1, because a wasteful offer must be made in Round 1.

The Offerer is willing to incur the cost of offering a first-round clause which is sure to be rejected because by doing so he prolongs the negotiations until the second round, when his offer may be accepted.

Equilibrium subgame payoffs are

$$\pi_{1o}^* + \pi_{2o}^* = -c_m + (x_s - c_s) \tag{30}$$

and, taking half of Equilibrium 1's payoff, (26),

$$\pi_{1a}^* + \pi_{2a}^* = y_s - c_i - \frac{c_i y_s}{y_m}, \tag{31}$$

for a total of

$$\pi^*_{1o} + \pi^*_{2o} + \pi^*_{1a} + \pi^*_{2a} = x_s + y_s - c_s - c_m - c_i - \frac{c_i y_s}{y_m}. \tag{32}$$

Assumptions (24) and (22) must be true for Equilibrium 4 to exist, for the same reasons as in Equilibrium 1. Since the Offerer must incur the contract-writing cost twice, while only one clause is possibly accepted, for Equilibrium 4 to exist requires that expression (30) be positive, a stronger condition than assumed so far.

Existence of Equilibrium 4 requires one other assumption: that

$c_s \geq c_m$. If this is false, then the Offerer would deviate to offer the cheaper sincere clause in Round 1 with probability 1, which condition (b) showed is impossible in any equilibrium.

EQUILIBRIUM 5: History Dependence.

Offerer: Offer a sincere clause in the first round with probability $p^*_{1s} = \frac{y_m - \left[y_s - c_i - \frac{c_i y_s}{y_m}\right]}{y_m - \left[y_s - c_i - \frac{c_i y_s}{y_m}\right] - c_i}$. If the first clause is accepted, offer a sincere clause in the second round with probability $p^*_{2s} = 1 - \frac{c_i}{y_m}$. If the first clause is rejected, do not offer a clause in the second round.

Accepter: Accept the first clause with probability $p^*_{1a} = \frac{(x_s - c_s + c_m) + (x_s - c_s)}{(x_s - c_s + x_m)}$. If the first clause was inspected and found to be misleading, reject any second-round offer. If the first clause was not inspected or not found to be misleading , accept the second clause with probability $p^*_{2a} = \frac{x_s - c_s + c_m}{x_m}$.

Out-of-equilibrium belief: If the Offerer offers a second clause after the first was rejected, the Accepter believes the second clause is sincere with a probability β of no more than $Max\{\frac{y_s}{y_s + y_m}, \frac{c_i}{y_s}\}$.

Here, the two rounds are connected in a more complicated way. If the game reaches the second round without it being revealed that the first clause was misleading, the Offerer's second-round expected payoff will be $x_s - c_s$, as in Equilibrium 1. If the game reaches the second round after it is revealed that the first clause was misleading, the Offerer's second-round expected payoff will be 0, because the Accepter will stop listening to him. Hence, the overall subgame payoffs from the Offerer's two first-round actions are:

$$(\pi^*_{1o} + \pi^*_{2o}) | (\textit{Sincere in the first round}) = -c_s + x_s + (x_s - c_s) \tag{33}$$

and

$$(\pi^*_{1o} + \pi^*_{2o})|(\textit{Misleading in the first round}) = -c_m + p_a[x_m + (x_s - c_s)] + [1 - p_a][0]. \tag{34}$$

Equating (33) and (34) to solve for the mixed-strategy equilibrium yields

$$-c_s + x_s + (x_s - c_s) = -c_m + p_a[x_m + (x_s - c_s)], \tag{35}$$

so

$$p^*_{1a} = 1 - \frac{(x_s - c_s)}{(x_s - c_s + x_m)}. \tag{36}$$

This is greater than the p^*_a found in Equilibrium 1— there is a greater likelihood that the Accepter will accept the first clause. Because the Acceptor would break off negotiations before the second round after discovering that the first offer was misleading, it is now less tempting for the Offerer to offer a misleading clause.

If the game reaches the second round without it being revealed that the first clause was misleading, the Accepter's second-round expected payoff will be $y_s - c_i - \frac{c_i y_s}{y_m}$, as in Equilibrium 1. The overall subgame payoffs from the Accepter's two first-round actions are:

$$(\pi^*_{1a} + \pi^*_{2a})|(\textit{Accept in the first round}) = p_s y_s - (1 - p_s) y_m + \left[y_s - c_i - \frac{c_i y_s}{y_m} \right] \tag{37}$$

and

$$(\pi^*_{1a} + \pi^*_{2a})|(\textit{Inspect in the first round}) = -c_i + p_s \left(y_s + \left[y_s - c_i - \frac{c_i y_s}{y_m} \right] \right) - (1 - p_s)(0+0) \tag{38}$$

Equating (37) and (38) to solve for the mixed-strategy equilibrium yields

$$p_s y_s - (1 - p_s) y_m + \left[y_s - c_i - \frac{c_i y_s}{y_m} \right] = -c_i + p_s \left(y_s + \left[y_s - c_i - \frac{c_i y_s}{y_m} \right] \right) \tag{39}$$

so

$$p^*_{1s} = 1 - \frac{c_i}{y_m - \left[y_s - c_i - \frac{c_i y_s}{y_m} \right]} \tag{40}$$

This is smaller than the value of p_s^* in Equilibrium 1, which was $1 - \frac{c_i}{y_m}$; in Equilibrium 5 the sincere clause is offered less often in the first round. The reason is that the Accepter would have to break off negotiations after discovering a misleading clause, so inspection is not so tempting an alternative to the Accepter as in Equilibrium 1.

The payoffs in Equilibrium 5 will be

$$\pi_{1o}^* + \pi_{2o}^* = 2(x_s - c_s) \tag{41}$$

and

$$\pi_{1a}^* + \pi_{2a}^* = (p_{1s}^* y_s - c_i) + p_{1s}^* \left(y_s - c_i - \frac{c_i y_s}{y_m} \right). \tag{42}$$

This payoff is lower than the payoff in Equilibrium 1 because (a) p_{1s}^* is lower in Equilibrium 5, so the first-round payoff of $p_s y_s - c_i$ is lower, and (b) the second-round payoff is multiplied by $p_s < 1$ in Equilibrium 5.

The total is

$$\pi_{1o}^* + \pi_{2o}^* + \pi_{1a}^* + \pi_{2a}^* = 2(x_s - c_s) + (p_{1s}^* y_s - c_i) + p_{1s}^* \left(y_s - c_i - \frac{c_i y_s}{y_m} \right). \tag{43}$$

Since the payoff to the Offeror is the same as in Equilibrium 1, and the payoff to the Accepter is lower, Equilibrium 5 has a lower social surplus.

EQUILIBRIUM 6: Peculiar History Dependence.

Offerer: Offer a sincere clause in the first round with probability $p^*_{1s} = \frac{(y_m - \left[y_s - c_i - \frac{c_i y_s}{y_m}\right]) - \left[y_s - c_i - \frac{c_i y_s}{y_m}\right] - c_i}{y_m - \left[y_s - c_i - \frac{c_i y_s}{y_m}\right]}$. If the first clause is accepted, offer a sincere clause in the second round with probability $p^*_{2s} = 1 - \frac{c_i}{y_m}$. If the first clause is inspected and found to be sincere, do not offer a clause in the second round.

Accepter: Accept the first clause with probability $p^*_{1a} = \frac{c_m}{x_m - x_s + c_s}$.. If the first clause was inspected and found to be sincere, reject any second-round offer. If the first clause was not inspected or not found to be sincere, accept the second clause with probability $p^*_{2a} = \frac{x_s - c_s + c_m}{x_m}$.

Out-of-equilibrium belief: If the Offerer offers a second clause after the first was found to be sincere, the Accepter believes the second clause is sincere with a probability β of no more than $Max\{\frac{y_s}{y_s + y_m}, \frac{c_i}{y_s}\}$.

The analysis is parallel to that of Equilibrium 5.

If the game reaches the second round without the first clause having been revealed to be sincere, the Offerer's second-round expected payoff will be $x_s - c_s$, as in Equilibrium 1. If the game reaches the second round after the first clause has been revealed to be sincere, the Offerer's second-round expected payoff will be 0, because the Accepter will stop listening to him. Hence, the overall subgame payoffs from the Offerer's two first-round actions are:

$$(\pi^*_{1o} + \pi^*_{2o}) | (\textit{Sincere in the first round}) = -c_s + x_s + p_a(x_s - c_s) + (1 - p_a)(0) \quad (44)$$

and

$$(\pi^*_{1o} + \pi^*_{2o}) | (\textit{Misleading in the first round}) = -c_m + p_a[x_m + (x_s - c_s)] + [1 - p_a][0 + (x_s - c_s)]. \quad (45)$$

Equating (44) and (45) to solve for the mixed-strategy equilibrium yields

$$p^*_{1a} = \frac{c_m}{x_m - x_s + c_s}. \quad (46)$$

If the game reaches the second round without the first clause having been revealed to be sincere, the Accepter's second-round expected payoff will be $y_s -$

$c_i - \frac{c_i y_s}{y_m}$, as in Equilibrium 1. The overall subgame payoffs from the Accepter's two first-round actions are:

$$(\pi^*_{1a} + \pi^*_{2a}) | (\textit{Accept in the first round}) = p_s y_s - (1 - p_s) y_m + \left[y_s - c_i - \frac{c_i y_s}{y_m} \right] \quad (47)$$

and

$$(\pi^*_{1a} + \pi^*_{2a}) | (\textit{Inspect in the first round}) = -c_i + p_s(y_s + 0) - (1 - p_s)(0 + \left[y_s - c_i - \frac{c_i y_s}{y_m} \right]). \quad (48)$$

Equating (47) and (48) to solve for the mixed-strategy equilibrium yields

$$p^*_{1s} = 1 - \frac{\left[y_s - c_i - \frac{c_i y_s}{y_m} \right] + c_i}{y_m - \left[y_s - c_i - \frac{c_i y_s}{y_m} \right]} \quad (49)$$

This is an even lower probability of a sincere offer than in Equilibrium 5. The payoffs in Equilibrium 6 can be easily computed, but since they are lengthy expressions of no great interest they will not be presented here.

6. INTERPRETATION

This simple model of negotiation generates a surprising number of plausible outcomes supported by simple and reasonable beliefs which are listed in Table 1.

In Equilibrium 1, each player is uncertain as to what will happen, and each takes chances. The Offerer takes a chance that the Accepter may inspect, and the Accepter takes a chance that the Offerer might have offered a misleading clause.

In Equilibrium 2, the players are pessimistic. The Accepter does not trust the Offerer, and so the Offerer does not attempt to offer extra clauses.

In Equilibrium 3, it is customary for the Offerer to offer one good clause, perhaps, but certainly not two.

In Equilibrium 4, it is customary for the Offerer to start with a misleading offer, before getting serious with his second offer. The first offer would appear ritualistic, since everybody knows it will be refused, but expectations make it a necessary part of the process.

All four equilibria seem realistic in different contexts, and, as

Table 1 shows, they can, together with the precommitment equilibria, be pareto-ranked. The best outcome is when the Offerer can be trusted to always offer only sincere clauses, and the next best is when the Accepter can be trusted to always inspect the clauses offered to him. These are placed above the line in Table 1 because they are really separate games from the equilibria of Section 6, in which precommitment is impossible. Of the four plausible equilibria in Section 6, the best involved mixed strategies in each round but no grudges following the discovery of attempted deception. Next best is when one offer is made, in the first round, which is better than when one possibly sincere offer is made, but only in the second round. Worst of all is when an atmosphere of mistrust prevents the Accepter from bothering to even inspect any clauses that might be offered to him, and so none are.

TABLE 1: THE SOCIAL SURPLUS

EQUILIBRIUM	TOTAL SURPLUS
Honest Offerer	$2(x_s + y_s - c_s)$
Careful Accepter	$2(x_s + y_s - c_s - \alpha^* c_i)$
1: Mixing Each Round	$2(x_s + y_s - c_s - c_i - \frac{c_i y_s}{y_m})$
2. No Offers	0
3. Just One Offer	$x_s + y_s - c_s - c_i - \frac{c_i y_s}{y_m}$
4. Customary Delay	$x_s + y_s - c_s - c_i - \frac{c_i y_s}{y_m} - c_m$

Equilibria 5 and 6 are excluded from Table 1 because the beliefs that support them are rather baroque, like sunspot equilibria but triggered by a public event involving the players' actions. Equilibrium 5 is plausible on its face, and seems to represent the situation where the Accepter becomes offended on discovering a misleading clause and refuses to negotiate further. That intuition, however, should really be the result of incomplete information, because it relies on the Accepter learning something about the Offerer's type, which does not happen in this model. The arbitrariness of Equilibrium 5 is shown by the existence of its twin, Equilibrium 6. In Equilibrium 6, it is as if the Accepter becomes offended on discovering that the clause is sincere, and refuses to negotiate further. This is absurd, but no more arbitrary than the belief in Equilibrium 5.

From the analysis, a number of lessons can be drawn.

1. Contract-reading costs matter as much as contract-writing costs. Al-

though the contract-writing costs c_s and c_m have an influence in this model, it would not be fundamentally changed if they were set to zero. As Table 1 shows, these costs are simply subtracted from the social surplus like any simple transactions cost. The contract-reading cost c_i is much more important. In Table 1, it has an indirect effect, via the subtraction of $\frac{c_i y_s}{y_m}$, as well as a direct effect. This effect is still continuous in c_i, so if contract-reading costs are small, it might seem that their effect on welfare is also low, but c_i has a second impact: it permits a variety of equilibria to exist. The contract-reading cost, in combination with unfortunate expectations, can lead to Equilibria 2,3, or 4, in which the benefit from at least one round of offers is lost. Because of this, the ultimate effect of a contract-reading cost of c_i can be much greater than c_i; in the extreme case of Equilibrium 2, a small contract-reading cost can destroy the entire gains from trade.

The existence of contract-reading costs is, moreover, both realistic and hard to eliminate institutionally.

It is relatively easy to write fifty new pages for a contract to provide for extra contingencies, but it is quite difficult for the reader to be sure what those fifty pages contain. Standard, "boilerplate" contracts are a good solution to the problem of contract-writing costs, but not to the problem of contract-reading costs. Boilerplate is easy to propose, but the accepting side of the contract still finds it difficult to know what the boilerplate contains.

2. Legal default rules, or even mandatory rules, can overcome contract-reading costs. Although boilerplate contracts are no solution, because unless they can somehow be guaranteed to be pure boilerplate with no additions, court or government-determined default rules can be a solution. If such rules exist, the two parties can refrain from writing anything, leaving the binding clause to be the default clause determined by an unbiased third party. The default rule is important for much more than just saving the costs c_i and c_s; even if the contract-reading and contract-writing costs are small, the default rule is important.[7]

One can go further and use this model to argue for mandatory contract rules, which override whatever may be written in the contract. If it is practical for a court to determine that a clause is misleading, the best solution is for courts to refuse to enforce such clauses. Modern courts try to do this, refusing to enforce suspicious fine printm, and that is the subject of the Katz (1990) article discussed in the Introduction.

[7]This result has previously been found in models of strategic contracting, but under incomplete information— see Ayres & Gertner (1989, 1992) and Johnston (1990).

The disadvantage of legal default and mandatory rules is, of course, that they reduce the flexibility of the contract. If different "sincere clauses" are appropriate for different contracts, it is difficult for courts to choose which clause should be used.

3. A reputation for honesty in negotiations is a valuable asset. The contracting parties are best off if the Offerer is inescapably honest. His honesty does not eliminate the contract-writing cost, but it does eliminate the need to inspect the contract and allows efficient clauses to be added. Any player who has established a reputation for honesty will in this context, as in others, be an attractive business partner and will be offered more attractive contracts.

4. Negotiation increases social welfare, even if it is costly. Even if the parties cannot trust each other, negotiation still increases welfare. The parties have the option to refuse to negotiate, and if they do so, it is in the hopes of creating surplus. Lengthy dealmaking sessions are not necessarily inefficient: to the extent that they add mutually beneficial details to the deal, they are efficient.

5. A mistrustful attitude in negotiations can be self-enforcing. If a model has multiple equilibria, that means that expectations are important to the outcome. If the Accepter expects the Offerer to offer only misleading clauses, he will not bother to inspect any clauses that are offered, and so the Offerer will offer none. This is the worst case from the point of view of both parties, and changing the expectations — however that might be done— is an important prerequisite to negotiations.

6. Frivolous offers can be part of rational, if inefficient, negotiations. If it is expected that the first clause offered will be misleading, that too can be self-enforcing, if not quite so harmful. The first clause offered will be dismissed without serious consideration, but it is still rational to offer it, because otherwise the negotiations cannot proceed to the second, serious round.

7. It is better to deal with someone who is on guard against you: good fences make good neighbors. Even if the Offerer cannot be trusted to be honest in the absence of external influences, if the Accepter can commit to always inspecting the offers, welfare is almost as high. Somewhat counterintuitively, the Offerer actually prefers to deal with an Accepter who always inspects the clauses. The Offerer need not worry about unfortunate expectations which would cause the Accepter to dismiss his offers without serious consideration.

8. Corporate lawyers are worth their salary even if they never discover flaws

in contracts. An immediate implication of lesson (6) is that inspection is valuable even if it never reveals anything untoward. The corporate counsel's veto of a contract term is like the atomic bomb, most useful when not used. The purpose of the legal staff is to deter the other side from trying to be sly or dishonest, and if the staff's lawyers are well enough respected, they will never discover any dishonesty.

The model may also have something to say about two other subjects: contractual default rules and product quality.

The issue of contractual default rules arises when a contract fails to specify certain details of the agreement or when it is claimed that the part of the contract which does specify them is invalid for one reason or another.

The 1990 article of A. Katz mentioned in the introduction examined the question of when a contractual party has duty to read the fine print provided by the other party and came to no definite conclusion except that circumstances exist when such a duty should not exist or when mandatory terms should replace the contractual terms. In another information-based model, Spier (1992) shows that contractual terms can be used by one of the parties to signal his hidden characteristics. Inefficient equilibria are commonly found in signalling games, and such remains the case when the signal is a contractual term or its absence. If, for example, some companies are of a type that will carry out an agreement and some are not, a company of the desirable type might choose not to offer a clause specifying damages for breach, even though such a clause might otherwise be desirable. Or, it might be that the necessary signal is to offer to strike such a clause from a standard-form contract, even though it is an efficient clause.

Thus, it might be efficient for a default rule to specify damages for breach, or even to have a mandatory rule that the parties cannot waive.

The present model of negotiation also has multiple equilibria, which can be pareto-ranked. In the worst equilibrium (equilibrium 2), no offers are made. It thus becomes quite important what the default rules are. They will be preferred precisely because they are default rules, rather than rules tailored by the offerer to the particular situation.

The negotiation model is not a signalling model. There is only one type of offerer, and the accepter's inferior information is only about the clause offered, not about the offerer. This means that unlike in the models of Katz or Spier, no argument can be made for mandatory contract rules, only for default rules. At the same time, since the combination of contract-reading costs and pessimistic

expectations can create high transactions costs, the default rules can be very important.[8]

Product quality is an area of economic analysis to which the negotiation model could also be applied. In the classic paper of

Klein & Leffler (1981), the basic problem is how a seller can, in the absence of warranties, persuade the buyer that the product is of high quality.

Their solution is for the seller to charge a premium over cost, which creates a stream of profits over time that the seller would be unwilling to jeopardize by deviating to low quality for one period of extraordinary profit. The negotiation model could be adapted to a different set of circumstances, where repeat purchases are not made but the buyer can inspect the product at low cost. The model suggests that expectations will determine the outcome, and that the equilibrium may be in mixed strategies or involve some rejection of inferior products before good products are produced. Product quality, however, is perhaps not so serious a problem as contract terms, because if the quality were the only problem, warranties could be provided. If it is the warranty itself, or some other contractual term, whose quality is in question because of what the fine print may say, the warranty solution fails. Thus, the model's main contribution to the product quality literature may be to suggest why warranties will not work.

The present model is only a first step in the analysis of negotiation, and it is simple enough that it can be extended in a number of directions. I will comment briefly on these extensions and speculate as to what they might show.

A first extension is to more than two rounds of offers.

It should be clear that the two-round model can easily be extended to many rounds, and that the same sorts of equilibria would continue to exist in the N-round game. The same mixing probabilities could be used in each round (equilibrium 1), there might be no offers made (equilibrium 2), only a limited numbers of offers might be made (equilibrium 3), no offers might be accepted until late in the game (equilibrium 4), or strange patterns of offers depending on history might comprise an equilibrium (equilibria 5 and 6). The results seem robust in this direction, and this extension is unlikely to yield anything by itself, though it might yield more

[8] For a somewhat contrary view, see A. Schwartz (1993), the main point of which is that contracts cover so many different situations that no single set of sensible default rules can be found, and that a better approach is for defaults to established in specialized areas of the law, e.g. computer law or securities law.

when combined with incomplete information.

A second extension is to repetition of the game. Two repetitions of a two-round game are different from one repetition of a 100-round game because even with the two repetitions, the accepter discovers the nature of the clauses costlessly after the first repetition, whereas in the 100-round game this is not discovered until it is too late to take action.[9] Repetition introduces the possibility of reputation, as in the Klein & Leffler (1981) model mentioned above, and may reach the same results as the commitment equilibria.[10]

A third extension is to incomplete information. Suppose the

offerer and the accepter do not know each other's costs of offering each type of clause, or of reading clauses. If, for example, a certain proportion of upright offerers have infinite moral costs of offering misleading clauses, then learning may occur during the negotiation process, since the discovery of a misleading clause in the first round would reveal to the accepter that he was not dealing with one of the upright offerers. Or, the model might specify situations where the set of available clauses is restricted. In the present model, the offerer is free to offer either kind of clause in either round, but one can also imagine that he might, for example, have only one welfare-improving clause available, so the issue becomes whether he offers it in the first, the second, or neither round. Incomplete information or restricted availability of welfare-improving clauses is unlikely to invalidate the lessons of this paper, but they may add new effects or equilibrium refinements that could not arise in the complete information game that was analyzed here.

[9]Note, however, that if a clause is rejected, its nature is never discovered by the accepter. Thus, repetition is no solution to the pessimistic expectations that underlie the No Offers equilibrium 2.

[10]A caveat: the fine print in contracts often concerns rare or end-game events— liability for toxic waste spills, or who pays for arbitration expenses. These, in fact, are the kinds of clauses for which inspection costs would be highest, since the rarity of their application would make them less familiar to the accepter. In such cases, the nature of the clause may ordinarily not be discovered even after the deal is closed, or may be discovered only when the relationship is terminated, so repetition may not be useful.

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