

# Break-Up Fees, Rent-Shifting, and Buyer Power\*

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## Abstract

When a buyer negotiates in sequence with two potential sellers of a good, the outcome of each negotiation depends on all three players' bargaining powers. In a model in which all parties are symmetrically informed, we find that the first seller's payoff is increasing in its own and the second seller's bargaining power, whereas the second seller's payoff is decreasing in the first seller's bargaining power and, in some cases, also in its own bargaining power. We characterize when contracts will contain break-up fees. All results extend to the case of one seller negotiating in sequence with two buyers.

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# 1 Introduction

Most studies of bargaining focus on the classic framework in which two players must divide a fixed amount of surplus. In this setting, the role of bargaining power is straightforward—a player with more bargaining power secures a greater proportion of the surplus. In many instances, however, surplus is divided among multiple players, some of whom may negotiate before others. In these latter settings, the role of bargaining power is less straightforward, and as we show in this paper, a player may not always prefer to have more bargaining power.

This is possible because when negotiations occur sequentially, the outcome of each bilateral negotiation will in general depend on all players’ bargaining powers. The outcome of a negotiation between a buyer and one seller, for example, may depend on what the buyer expects to obtain if and when it negotiates with a second seller, and similarly the outcome of the second negotiation may depend on what the buyer did or did not negotiate with the first seller. In these settings, bargaining power may play an important role not only in determining the division of surplus, but also in determining the amount to be divided.

In this paper, we investigate this dual role of bargaining power by studying a sequential-contracting model similar to that of Aghion and Bolton (1987)—but extended to allow for bargaining—in which a buyer with unit demand negotiates in sequence with two potential sellers, labeled seller 1 and seller 2. We posit a simple non-cooperative bargaining game in which within each bilateral negotiation, one player makes a take-it-or-leave-it offer to the other. To capture the role of bargaining power, we assume that each player gets to make the offer with some probability. Thus, in the first negotiation, seller 1 makes a take-it-or-leave-it offer to the buyer with probability  $\lambda_1$  and the buyer makes the offer with probability  $1 - \lambda_1$ , and in the second negotiation, seller 2 makes a take-it-or-leave-it offer to the buyer with probability  $\lambda_2$ , and the buyer makes the offer with probability  $1 - \lambda_2$ . We assume that when negotiating in stage 1, the buyer and seller 1 do not know which player will get to make the offer in stage 2 (unless  $\lambda_2$  equals zero or one), but they do know the relevant probabilities.

We show in this setting that when all parties are symmetrically informed and below-cost pricing is prohibited, the sellers’ payoffs may depend on their bargaining powers in counterintuitive ways.<sup>1</sup> For example, we find that each seller will differ on whether it wants the other seller to have more or less bargaining power; the first seller always prefers that the second seller have more bargaining power, while the second seller always prefers that the first

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<sup>1</sup>In contrast, if below-cost pricing is feasible, the buyer and first seller will be able to extract all surplus from the second seller when all parties are symmetrically informed (see Aghion and Bolton, 1987).

seller have less bargaining power. We also find that, in some cases, the surplus extracted from the second seller increases with the second seller's bargaining power, implying that, in these cases, the second seller's payoff may be *decreasing* in its own bargaining power.<sup>2</sup> This follows because the second seller's bargaining power affects both the size of the surplus that remains undivided after the first negotiation and how much of that surplus the second seller can capture. Since the size of the surplus remaining from the first negotiation is decreasing in the second seller's bargaining power, an increase in the second seller's bargaining power gives it a larger share of a smaller surplus, which in some cases can mean a smaller overall payoff. In contrast, the first seller's payoff is always increasing in its own bargaining power since this gives it a larger share of a larger surplus. Thus, when contracts are negotiated sequentially, the last seller to negotiate with the buyer may actually benefit from an increase in buyer power because when it has more bargaining power, the buyer will be tougher in its earlier negotiations, which in turn leaves more surplus to be divided in the last negotiation.

These results contrast with those in Rubinstein-Ståhl type of bargaining models in which the players typically negotiate to maximize their joint surplus and then split it according to each player's bargaining power.<sup>3</sup> In these environments, each player's payoff is increasing in its own bargaining power and decreasing in the bargaining power of its rival.<sup>4</sup> In our model, however, subgame-perfect equilibria exist in which the players' overall joint surplus is maximized, but the bargaining outcomes of the earlier negotiations affect the bargaining outcomes of the later negotiations, and the outcome of each negotiation depends on the distribution of bargaining powers among all players, not just those of the pair participating in an individual negotiation. As a result, a seller's payoff can be increasing or decreasing in its own bargaining power, and increasing or decreasing in the rival seller's bargaining power.

Our results have implications for the ongoing policy discussion in the U.S. and Europe on the welfare effects of increasing buyer power.<sup>5</sup> Policy makers routinely express concern that

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<sup>2</sup>Merlo and Wilson (1995) also posit a sequential bargaining model with multiple players and find that a player's expected payoff can be reduced by an increase in its bargaining power. Unlike in our model, however, all players in their model receive offers in each period, the continuation game does not depend on the actions of the players in the current period, and the size of the pie is randomly determined each period.

<sup>3</sup>See the seminal works of Rubinstein (1982) and Ståhl (1972). For an overview, see Sutton (1986).

<sup>4</sup>A large part of the bargaining literature focuses on adaptations of the Rubinstein-Ståhl alternating-offers bargaining game. However, an important feature of these models is that if agreement is reached, the game ends; and if agreement is not reached, the game continues, but the continuation game is not affected by players' prior actions. Thus, in these models, offers in one round do not affect later rounds of negotiations.

<sup>5</sup>See, for example, Office of Fair Trading (1995), OECD (1999) and the papers by Foer, Dobson, Grimes, Noll, Kirkwood, and Salop (2005) in the symposium on buyer power in the *Antitrust Law Journal*. See also the discussions in Dobson et al. (1998), Dobson Consulting (1999), Schwartz (2004), and Carstensen (2004).

an increase in buyer power may harm sellers, thereby reducing their incentives to innovate. But, as pointed out by Inderst and Wey (2007), the effect of buyer power on a seller’s investment incentives depends on how it affects the latter’s marginal profits, not total profit. As they show, it is possible for an increase in buyer power to increase –not decrease– suppliers’ incentives. This paper adds to the policy discussion by noting in addition that total profit need not decrease as not all sellers are necessarily worse off when buyer power increases.

Our results also have implications for the literature on rent-shifting. In Aghion and Bolton’s (1987) model with one buyer, two sellers, and complete information, the buyer and first seller can extract all the surplus from the second seller by agreeing to a contract in which the buyer pays a break-up fee to the first seller if it buys from the second seller.<sup>6</sup> However, Aghion and Bolton’s model fixes all bargaining power in the hands of the sellers. In contrast, we show that when bargaining power is more evenly distributed, equilibrium contracts may not always entail break-up fees, and when below-cost pricing is infeasible, full extraction from the second seller may not always occur. The reason is that when it has bargaining power, the buyer is no longer indifferent between contracts that penalize it for trading with the second seller and contracts in which it is rewarded with a low price for trading with the first seller. Although both a break-up fee and a low price increase the buyer’s opportunity cost of trading with the second seller, only the former represents an out-of-pocket cost to the buyer if it actually trades with the second seller. Thus, all else being equal, the buyer will prefer low prices to break-up fees. It follows that when the buyer has bargaining power and thus can make offers, break-up fees may not arise and full extraction may not be possible.

The paper proceeds as follows. In Section 2, we describe the model. In Section 3, we present our main results. In Section 4, we show that the model can be extended to the case of two buyers and a common seller, and we discuss applications. In Section 5, we conclude.

## 2 Model

We consider a model with perfect information in which there are two sellers, 1 and 2, and a single buyer. The buyer receives utility from consuming at most one unit of one good. It receives utility  $R_1$  if it purchases from seller 1,  $R_2$  if it purchases from seller 2, and zero if

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<sup>6</sup>Other rent-shifting literature considers cases in which a buyer negotiates purchases of goods from multiple sellers of competing products (e.g., Spier and Whinston, 1995; Marx and Shaffer, 1999; and Marx and Shaffer, 2002), a firm negotiates wage contracts with more than one labor union (e.g., Dobson, 1994; and Marshall and Merlo, 2004), a firm’s CEO negotiates financial terms with several creditors (e.g., Perotti and Spier, 1993), and a firm or an individual negotiates contracts with multiple health care providers (Pauly, 1974).

it purchases nothing.<sup>7</sup> Seller  $i$ 's opportunity cost of selling a single unit is  $c_i$ . For ease of exposition, assume  $R_i > c_i$  for all  $i \in \{1, 2\}$ , and let  $\Pi_i \equiv R_i - c_i$  denote the overall joint payoff of the three players when the buyer purchases from seller  $i$ . Then, our assumptions imply that  $\Pi_i > 0$ . In what follows, we say that seller  $i$  is more efficient than seller  $j$  if and only if  $\Pi_i > \Pi_j$ , for all  $j \neq i$ . The two sellers are equally efficient if and only if  $\Pi_i = \Pi_j$ .

The game consists of three stages. In stage one, the buyer and seller 1 negotiate a contract for the purchase of one unit of good 1. The contract specifies a payment  $T_{11}$  if the buyer purchases from seller 1 and a payment  $T_{10}$  if the buyer does not purchase from seller 1. In stage two, the buyer and seller 2 negotiate a contract for the purchase of one unit of good 2, specifying payments  $T_{22}$  and  $T_{20}$ . Let  $T_i$  denote the buyer's contract with seller  $i$ . In stage three, the buyer decides which (if any) good to purchase and makes the required payments.

We assume the buyer can not purchase from a seller with whom it has no contract. Thus, if a seller has no contract with the buyer, the seller's payoff is zero. If seller  $i$  has a contract with the buyer, the seller's payoff is  $T_{ii} - c_i$  if the buyer purchases from him, and  $T_{i0}$  otherwise. The buyer's payoff is  $R_i - T_{ii} - T_{j0}$  if it purchases from seller  $i \neq j$ , where  $T_{j0} = 0$  if no contract with seller  $j$  has been signed. If the buyer does not purchase from either seller, its payoff is  $-T_{10} - T_{20}$ , where  $T_{i0} = 0$  if there is no contract with seller  $i$ .

We use as our bargaining protocol a simple non-cooperative bargaining game in which in each negotiation one player makes a take-it-or-leave-it offer to the other. In this environment, we equate a player's bargaining power with the probability with which it gets to make the offer; the greater the probability of making the offer, the greater is the player's bargaining power.<sup>8</sup> This approach of allowing there to be some probability with which each player has the power to make a take-it-or-leave-it offer in its respective negotiation is made for convenience and allows us to avoid mixing cooperative and non-cooperative solution concepts. It also allows us to capture the possibility that there is uncertainty about the future state of the world, and thus uncertainty about the determinants of future bargaining power.<sup>9</sup> In the

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<sup>7</sup>We could also allow the buyer to purchase from both sellers and then discard one of the units, but this would never happen in equilibrium as the sellers could simply prohibit the buyer from doing so with exclusive-dealing clauses in their contracts. Hence, allowing it as an option does not affect the equilibrium.

<sup>8</sup>In an earlier version of this paper, we showed that our qualitative results continue to hold in a cooperative bargaining framework such as generalized Nash bargaining, which also allows the parameterization of the players' bargaining powers (see, for example, Binmore, 1985). In particular, our efficiency properties and comparative static results hold when the expected payoffs from the randomized take-it-or-leave-it offers are replaced with the payoffs given by the cooperative bargaining solution. The proof is available on request.

<sup>9</sup>Because we assume take-it-or-leave-it offers bargaining, we can capture uncertainty about the division of surplus through uncertainty about which player will make the offer. In other models of bargaining, the determinants of the division of surplus differ, and so such uncertainty about the division of surplus would

case of a retailer firm and two suppliers, when the retailer negotiates with the first supplier, it may not know various economic factors that will affect what the second supplier's other options will be, whether there will be good substitutes for the second supplier's product, or how risk averse the second supplier will be. Thus, when the retailer and first supplier negotiate, they may not know which player will be making the offer in the future negotiation.

We assume that with probability  $\lambda_1 \in [0, 1]$ , seller 1 makes a take-it-or-leave-it offer to the buyer in stage one, and with probability  $1 - \lambda_1$ , the buyer makes a take-it-or-leave-it offer to seller 1 in stage one. Similarly, with probability  $\lambda_2 \in [0, 1]$ , seller 2 makes a take-it-or-leave-it offer to the buyer in stage two, and with probability  $1 - \lambda_2$ , the buyer makes a take-it-or-leave-it offer to seller 2 in stage two. Parameters  $\lambda_1$  and  $\lambda_2$  measure the bargaining powers of sellers 1 and 2, respectively, in the sense that a larger value of  $\lambda_i$  implies that seller  $i$  has more bargaining power. In the special case of  $\lambda_i = 1$ , seller  $i$  has all the bargaining power (with respect to the buyer), in the case of  $\lambda_i = 0$ , the buyer has all the bargaining power (with respect seller  $i$ ), and in the case of  $\lambda_i = \frac{1}{2}$ , the buyer and seller  $i$  have equal bargaining power. The timing of the game is such that when the buyer and seller 1 negotiate their contract in stage one, they do not know which player will make the offer in stage two.

### 3 Results

We consider first the equilibrium of the stage-two negotiation taking contract  $T_1$  as given. If the buyer makes the offer in stage two, then clearly it is an equilibrium for the buyer to offer seller 2 a contract that just covers seller 2's cost if the buyer purchases from seller 2, and pays zero to seller 2 otherwise. In this case, whether or not the buyer purchases from seller 2 (and thus not from seller 1) in stage three depends on whether its payoff from doing so,  $\Pi_2 - T_{10}$ , is greater than or less than its payoff from purchasing from seller 1,  $R_1 - T_{11}$ .

**Lemma 1** *Given  $T_1$  from stage one, if the buyer makes the offer in stage two, then there is an equilibrium of the continuation game in which the buyer offers  $T_2^b$  defined by*

$$T_{22}^b \equiv c_2 \quad \text{and} \quad T_{20}^b \equiv 0.$$

*Furthermore, if  $\Pi_2 - T_{10} < R_1 - T_{11}$  holds, then the buyer purchases from seller 1 in stage*

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be modeled differently. For example, in Rubinstein alternating-offers bargaining (Rubinstein, 1982), the division of surplus depends on players' discount factors and on which player makes the first offer, and in Nash bargaining (Nash, 1950), the division of surplus depends on the degree of risk aversion of the players.

three and pays  $T_{11}$  to seller 1 and zero to seller 2; and if  $\Pi_2 - T_{10} > R_1 - T_{11}$  holds, then the buyer purchases from seller 2 in stage three and pays  $T_{10}$  to seller 1 and  $c_2$  to seller 2.

*Proof.* See the Appendix.

If seller 2 makes the offer in stage two, then seller 2 will offer a contract that extracts all the buyer's rent from negotiating with it, taking into account the buyer's alternative of purchasing from seller 1 and receiving  $R_1 - T_{11}$  or purchasing nothing and receiving  $-T_{10}$ .

**Lemma 2** *Given  $T_1$  from stage one, if seller 2 makes the offer in stage two, then there is an equilibrium of the continuation game in which seller 2 offers  $T_2^s(T_1)$  defined by*

$$T_{22}^s(T_1) \equiv \max \{c_2, R_2 - T_{10} - \max \{R_1 - T_{11}, -T_{10}\}\} \quad \text{and} \quad T_{20}^s \equiv 0.$$

Furthermore, if  $\Pi_2 - T_{10} < R_1 - T_{11}$  holds, then the buyer purchases from seller 1 in stage three and pays  $T_{11}$  to seller 1 and zero to seller 2, and if  $\Pi_2 - T_{10} > R_1 - T_{11}$  holds, then the buyer purchases from seller 2 in stage three and pays  $T_{10}$  to seller 1 and  $T_{22}^s(T_1)$  to seller 2.

*Proof.* See the Appendix.

Once again, we find that whether the buyer purchases from seller 2 in stage three depends on whether the buyer and seller 2's joint payoff when the buyer purchases from seller 2 is greater or less than the joint payoff of the buyer and seller 2 when the buyer purchases from seller 1. Lemmas 1 and 2 thus imply that regardless of who makes the offer in stage two, the buyer will purchase from seller 1 if  $R_1 - T_{11} > \Pi_2 - T_{10}$  and from seller 2 if otherwise.

An immediate implication of this finding is that the buyer will never purchase from seller 2 if seller 2 is inefficient. This is because if the buyer purchases from seller 2 when seller 2 is inefficient, seller 1 earns  $T_{10}$  and the buyer earns  $R_2 - T_{22}^s - T_{10}$ . But by negotiating

$$T_{11} = R_1 - \Pi_2 + T_{10} - \epsilon, \tag{1}$$

where  $\epsilon > 0$ , the buyer and seller 1 can induce the buyer to purchase from seller 1 in stage three, yielding payoff  $T_{11} - c_1$  to seller 1 and  $R_1 - T_{11}$  to seller 2. Substituting  $T_{11}$  into these payoffs, it follows that for small enough  $\epsilon$ , the buyer and seller 1 are strictly better off. Similar reasoning establishes that trade will not occur with seller 1 if seller 1 is inefficient.

**Proposition 1** *A subgame-perfect equilibrium (SPE) exists, and in all SPE the buyer purchases from a seller only if that seller is efficient.*

*Proof.* See the Appendix.

Proposition 1 implies that efficiency is obtained in all equilibria. The offers are chosen in stage one to maximize overall joint payoff and surplus is extracted either through the use of break-up fees in which the buyer pays seller 1 if it purchases from seller 2 (that is, by choosing  $T_{10} > 0$ ) and/or by setting  $T_{11}$  appropriately. Thus, Proposition 1 extends Aghion and Bolton (1987)'s model with perfect information by showing that a more even distribution of bargaining power does not affect the efficiency properties of the equilibrium outcome.

As we show in the next subsection, however, the distribution of bargaining power does affect the degree to which the buyer and seller 1 can extract surplus from seller 2, and as we show in the remainder of this subsection, it also affects whether the buyer and seller 1 will resort to the use of break-up fees as a means of extracting some or all of seller 2's surplus.

When seller 2 is more efficient than seller 1, a key feature of the equilibrium contracts is the specification of payments to seller 1 in the event the buyer subsequently chooses to purchase from seller 2. This can happen, for example, when seller 1 makes the offer in stage one, but only if seller 2 has some bargaining power, because only then is seller 1 valuable to the buyer as an outside option. In the case where seller 2 is the efficient seller and has no bargaining power, the buyer has no incentive to contract with seller 1, much less consent to a break-up fee. Similarly, break-up fees play no role if seller 2 is less efficient than seller 1. For in that case, Proposition 1 implies that the buyer will always purchase its unit from seller 1.

We now characterize the use of break-up fees in equilibrium.

**Proposition 2** *If seller 1 is inefficient, then in all SPE the buyer pays a break-up fee to seller 1 if and only if seller 1 makes the offer in stage one and  $\lambda_2 > 0$ . When a break-up fee is paid in equilibrium, the amount that is paid is increasing in seller 2's bargaining power.*

*Proof.* See the Appendix.

Proposition 2 implies that break-up fees will only be observed when both sellers have some bargaining power. It also implies that break-up fees will always be observed when seller 1 has all the bargaining power in stage one, seller 2 has some bargaining power in stage two, and the buyer purchases from seller 2. Break-up fees will not be observed, however, when

seller 2 has no bargaining power or when the buyer makes the offer in stage one. The reason for this result is that when the buyer has bargaining power, its preferred method of surplus extraction is to have a lower price in place with the first seller for the seller's unit. This is because although both a break-up fee and lower unit price increase the buyer's opportunity cost of trading with the second seller, only the former represents an out-of-pocket cost to the buyer if it actually trades with the second seller. Thus, the buyer has no incentive to offer a break-up fee to seller 1 when it makes the offer in stage one, and it has no incentive to accept a break-up fee when seller 1 makes the offer but  $\lambda_2 = 0$  (i.e, the buyer has all the bargaining power with respect to seller 2). Hence, in these cases, break-up fees do not arise in equilibrium. Otherwise, break-up fees arise in equilibrium and are increasing in seller 2's bargaining power, as then the buyer's outside option *vis a vis* the first seller is decreasing.

### 3.1 Full extraction and below-cost pricing

We now turn our attention to the  $T_{11}$  term in the buyer and seller 1's contract and consider how it and  $T_{10}$  interact to allow surplus extraction from seller 2 when seller 2 is efficient. In particular, we begin by considering when full extraction from seller 2 is and is not possible.<sup>10</sup>

It should be clear that seller 2's payoff is zero if the buyer makes the offer in stage two. It should also be clear that seller 2's payoff is zero if the buyer purchases from seller 1. Thus, it remains only to consider cases in which the buyer purchases from seller 2 and there is some chance that seller 2 makes the offer. In these cases, seller 2 earns zero payoff if and only if<sup>11</sup>

$$c_2 = R_2 - T_{10} - R_1 + T_{11}, \tag{2}$$

or, equivalently, if and only if

$$c_1 + \Pi_1 - \Pi_2 = T_{11} - T_{10}. \tag{3}$$

In the absence of restrictions on  $T_{11}$  and  $T_{10}$ , condition (3) will be satisfied in any SPE in

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<sup>10</sup>We will focus here on the case where seller 2 is efficient (otherwise, full extraction from seller 2 trivially holds). One can think of the order of negotiations as being exogenously given, with seller 1 being inefficient, or, one can think of the buyer as having chosen to negotiate first with the inefficient seller. Such a choice turns out to be weakly optimal, as it is straightforward to show that the buyer's payoff is independent of the order of negotiations when below-cost pricing is infeasible, whereas it weakly prefers to negotiate first with the inefficient seller when below-cost pricing is feasible. See also the discussion in Marx and Shaffer (2007).

<sup>11</sup>If  $c_2 > R_2 - T_{10} - R_1 + T_{11}$  then the buyer purchases from seller 1, and if  $c_2 < R_2 - T_{10} - R_1 + T_{11}$ , so that the buyer purchases from seller 2, then Lemma 2 implies  $T_{22}^s > c_2$  and seller 2 earns positive payoff.

which the buyer purchases from seller 2 and  $\lambda_2 > 0$ , regardless of whether the buyer or seller 1 makes the offer in stage one. To see this, note that in these cases, the buyer's expected payoff in the continuation game after stage one, if it has a contract in place with seller 1, is

$$\lambda_2 (R_1 - T_{11}) + (1 - \lambda_2) (\Pi_2 - T_{10}), \quad (4)$$

where, in the continuation game,  $R_1 - T_{11}$  is the buyer's payoff if seller 2 makes the offer in stage two and  $\Pi_2 - T_{10}$  is the buyer's payoff if the buyer makes the offer in stage two. Proceeding back to the first stage, if the buyer makes the offer, then the buyer maximizes its payoff in (4), subject to seller 1 earning non-negative payoff, by choosing  $T_{10} = 0$  and  $T_{11} = c_1 + \Pi_1 - \Pi_2$ , thus satisfying condition (3) and earning payoff  $\Pi_2$ . If instead seller 1 makes the offer in stage one, seller 1 maximizes its payoff,  $T_{10}$ , subject to the buyer earning its outside option,  $(1 - \lambda_2)\Pi_2$ , by choosing  $T_{10}$  and  $T_{11}$  to satisfy condition (3) and

$$\lambda_2 (R_1 - T_{11}) + (1 - \lambda_2) (\Pi_2 - T_{10}) = (1 - \lambda_2)\Pi_2, \quad (5)$$

which ensures that the buyer earns its outside option, with seller 1 earning  $\Pi_2 - (1 - \lambda_2)\Pi_2$ .<sup>12</sup> The unique solution entails seller 1 choosing  $T_{11} = c_1 + \Pi_1 - (1 - \lambda_2)\Pi_2$  and  $T_{10} = \lambda_2\Pi_2$ .

This shows that full extraction is achieved in any SPE in which the buyer purchases from seller 2 and  $\lambda_2 > 0$ . But notice from condition (3), however, that if  $T_{10} < \Pi_2 - \Pi_1$ , as it must be in these cases if the buyer makes the offer in stage one or its outside option with seller 1 in stage one is sufficiently large, seller 1 would have to be willing to sell its unit at a loss if full extraction from seller 2 is to be achieved. Thus, for example, if seller 1 is inefficient, so that  $\Pi_2 > \Pi_1$ , and the buyer makes the offer in stage one, then seller 1 must agree to sell at

$$T_{11} = c_1 + \Pi_1 - \Pi_2 < c_1,$$

if full extraction is to be achieved, and if seller 1 makes the offer in stage one, it must set

$$T_{11} = c_1 + \Pi_1 - (1 - \lambda_2)\Pi_2,$$

if full extraction is to be achieved, where  $T_{11}$  is less than  $c_1$  if and only if  $(1 - \lambda_2)\Pi_2 > \Pi_1$ .<sup>13</sup>

Although, in principle, an offer to sell at a loss may be feasible, in practice, such contracts

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<sup>12</sup>The buyer's outside option,  $(1 - \lambda_2)\Pi_2$ , is what it could expect to earn if it rejected seller 1's offer.

<sup>13</sup>In the case of the buyer making the offer,  $T_{11}$  is found by setting  $T_{10} = 0$  and solving condition (3). In the case of seller 1 making the offer,  $T_{11}$  is found by choosing  $T_{10}$  and  $T_{11}$  to solve conditions (3) and (5).

are typically problematic. In the antitrust arena, laws against predatory pricing hold firms liable if they sell their products at below-cost prices, so a contract between the buyer and seller 1 that involves below-cost pricing may not be enforceable or provide a credible source of supply for the buyer. For example, if negotiations with seller 2 broke down and the buyer purchased from seller 1, seller 2 could sue and claim that seller 1's below-cost pricing had foreclosed it from the market. Since the facts would show that seller 2 was indeed excluded, and since seller 1 would have sold its unit at below-cost, it is likely that the courts would find against seller 1. Even if it were ultimately to prevail in court, the specter of a lengthy trial or an out-of-court settlement might nevertheless prove to be quite costly for seller 1.

Seller 1 might be able to avoid setting or agreeing to  $T_{11} < c_1$  if non-contingent transfer payments are feasible. To see this, suppose, for example, that seller 1 makes the offer in stage one and  $(1 - \lambda_2)\Pi_2 > \Pi_1$ , implying that seller 2 is efficient and full extraction would otherwise require setting  $T_{11} < c_1$ . Then seller 1 could achieve full extraction by offering the buyer an upfront payment of  $(1 - \lambda_2)\Pi_2 - \Pi_1$  in exchange for the buyer signing a contract with  $T_{11} = c_1$  and  $T_{10} = \Pi_2 - \Pi_1$ . The buyer would accept the offer, and given this, in stage two, seller 2's surplus would be fully extracted for the reasons discussed above. However, notice that the buyer's net payment to seller 1 in this case if negotiations with seller 2 were to break down and as a result it were to buy from seller 1 would be  $c_1 + \Pi_1 - (1 - \lambda_2)\Pi_2$ , i.e., its cost of purchasing from seller 1 less the upfront payment it received when it signed the agreement. Once again, seller 2 could sue claiming that it had been illegally foreclosed, and once again exclusion of seller 2 would be coupled with evidence of below-cost pricing.

Contracts involving below-cost pricing may also be problematic in settings other than goods markets. In labor markets, for example, where the players are employers and employees, an employee (seller) can in many cases legally break his contract without compensating the employer (buyer) by quitting, so an employee's contractual agreement to supply labor at less than his opportunity cost of time if called upon to do so, may not provide a credible threat for the employer of this employee when, for example, she is negotiating with a second employee. If negotiations with the second employee were to break down, the first employee would quit rather than honor his agreement, thereby vitiating the threat of the employer.<sup>14</sup>

Thus, for these reasons, it is useful in the next proposition to summarize our findings above for the case in which below-cost pricing is feasible and for the case in which it is not.<sup>15</sup>

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<sup>14</sup>Here the possibility of upfront payments might suffice to mitigate ex-post incentives to quit, but these payments would require potentially deep pockets on the part of the employee, which may not be realistic.

<sup>15</sup>The interested reader may wonder whether it is still the case that all equilibria will be efficient if below-cost pricing is infeasible. The answer is no because SPE exist in which the buyer purchases from the

**Proposition 3** *If below-cost pricing is feasible, seller 2 is inefficient, or  $\lambda_2 = 0$ , then seller 2 earns zero payoff in all SPE. If below-cost pricing is not feasible, seller 1 is inefficient, and  $\lambda_2 > 0$ , then seller 2 earns positive expected payoff in all SPE if and only if either the buyer makes the offer in stage one and  $\lambda_2 < 1$ , or seller 1 makes the offer and  $\Pi_1 < (1 - \lambda_2)\Pi_2$ .*

*Proof.* See the Appendix.

Proposition 3 implies that even though there is perfect information, the second seller's surplus may not be fully extracted if the second seller is efficient and below-cost pricing is infeasible. This result contrasts with that of Aghion and Bolton (1987), where full extraction always occurs when there is perfect information (this is because in Aghion and Bolton, both sellers make the offers and thus below-cost pricing is not a feature of equilibrium contracts).

The inability of the buyer and seller 1 to fully extract seller 2's surplus in all cases when below-cost pricing is infeasible can be understood intuitively by noting that the buyer and seller 1 can extract surplus from seller 2 either by decreasing  $T_{11}$  or increasing  $T_{10}$ . Extraction that occurs through a reduction in  $T_{11}$  increases the buyer's expected payoff, while extraction that occurs through an increase in  $T_{10}$  decreases the buyer's expected payoff. Thus, if the buyer has all the bargaining power in stage one, it will prefer to extract seller 2's surplus by reducing  $T_{11}$  without increasing  $T_{10}$ . In fact, if  $\lambda_2 < 1$  it will never be profitable for the buyer to offer seller 1 a contract with  $T_{10} > 0$ . But if  $T_{11}$  is bounded below by  $c_1$ , then from condition (3), full extraction requires that  $T_{10} \geq \Pi_2 - \Pi_1$ , and thus it follows that seller 2 will have positive expected payoff if there is any chance of the buyer making the offer in stage one. If seller 1 has all the bargaining power in stage one, then whether full extraction is possible depends on what the buyer could earn if it rejected seller 1's contract. If the buyer's outside option is such that  $(1 - \lambda_2)\Pi_2 > \Pi_1$ , then the buyer will reject any offer from seller 1 with  $T_{10} \geq \Pi_2 - \Pi_1$ , which ensures that seller 2 will have positive expected payoff.

### 3.2 Comparative statics

A restriction on below-cost pricing has some surprising implications for the effects of bargaining power on each player's payoff. For example, we have seen that when seller 1 makes

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inefficient seller if and only if seller 2 is the efficient seller,  $\lambda_1 < 1$ , and  $\lambda_2 = 1$ . For example, if  $\lambda_1 = 0$ ,  $\lambda_2 = 1$ , and  $\Pi_1 < \Pi_2$ , then there is an equilibrium in which the buyer offers seller 1 a contract with  $T_{11} = c_1$  and  $T_{10} = \Pi_2 - \Pi_1$  and does not contract with seller 2 (in the continuation game, seller 2 is indifferent between offering a contract that is accepted by the buyer and not). However, in these cases equilibria in which the buyer purchases from the efficient seller also exist, and the inefficient equilibria are always Pareto-dominated.

the offer in stage one and seller 2 is efficient, seller 2's payoff is zero if below-cost pricing is feasible or  $\lambda_2$  is such that  $\Pi_1 > (1 - \lambda_2)\Pi_2$ . But if below-cost pricing is infeasible and its bargaining power is sufficiently low but non-zero, then, surprisingly, seller 2 may earn positive expected payoff. This implies that non-local increases in seller 2's bargaining power may actually make seller 2 worse off. We summarize this result in the following proposition.

**Proposition 4** *If  $\Pi_2 > \Pi_1$  and below-cost pricing is infeasible, seller 2 may earn higher expected payoff with a small amount of bargaining power than with all the bargaining power.*

The result in Proposition 4 turns on the relation between  $\Pi_1$  and  $(1 - \lambda_2)\Pi_2$ . If the latter is greater and below-cost pricing is infeasible, then we have seen that the buyer strictly gains from purchasing from seller 2 and so seller 2 earns positive expected payoff if  $\lambda_2 > 0$ . In contrast, if  $\Pi_1 > (1 - \lambda_2)\Pi_2$  then seller 1's optimal contract if it makes the offer in stage one is  $T_{11} = c_1 + \Pi_1 - (1 - \lambda_2)\Pi_2$  and  $T_{10} = \lambda_2\Pi_2$ , giving seller 2 zero payoff.<sup>16</sup> Intuitively, when seller 1 makes the offer in stage one, seller 2 must rely on the buyer to reject any offer that extracts all of seller 2's surplus. But the buyer will reject such offers only if its probability of making the offer in stage two is sufficiently large that it prefers to take a chance on being able to extract seller 2's surplus for itself (rather than giving it to seller 1).

### The effects of local changes in bargaining power

Proposition 4 is concerned with the effects of non-local changes in seller 2's bargaining power. We now consider how local changes in each player's bargaining power affect the distribution of surplus among all three players. We first solve for the expected equilibrium payoffs and then conduct comparative statics with respect to each player's bargaining power.

To simplify, we focus on the case in which seller 2 is efficient and below-cost pricing is infeasible. In this case, if the buyer makes the offer in stage one, then in any efficient SPE, we have seen that the buyer will offer  $T_{11} = c_1$  and  $T_{10} = 0$ , giving seller 1 a payoff of zero, the buyer an expected payoff of  $\lambda_2\Pi_1 + (1 - \lambda_2)\Pi_2$  (where we have substituted  $T_{11}$  and  $T_{10}$  into condition (4)), and seller 2 an expected payoff of  $\Pi_2 - (\lambda_2\Pi_1 + (1 - \lambda_2)\Pi_2) = \lambda_2(\Pi_2 - \Pi_1)$ .

If seller 1 makes the offer in stage one and  $(1 - \lambda_2)\Pi_2 < \Pi_1$ , so that full extraction is possible, then in any efficient SPE, we have seen that seller 2 earns zero, the buyer earns

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<sup>16</sup>To see this, note that under this contract, the buyer's expected payoff is  $(1 - \lambda_2)\Pi_2$  if seller 2 gets to make the offer in stage two (if seller 2 does not leave the buyer with surplus at least  $(1 - \lambda_2)\Pi_2$ , the buyer declines seller 2's offer and purchases from seller 1) and is  $\Pi_2 - T_{10} = (1 - \lambda_2)\Pi_2$  if it gets to make the offer in stage two. Thus, the buyer earns  $(1 - \lambda_2)\Pi_2$ . Because the proposed contract  $T_1$  maximizes seller 1's payoff of  $T_{10}$  subject to the constraint of meeting the buyer's outside option, it is an optimal contract offer.

$(1 - \lambda_2)\Pi_2$ , and seller 1 earns  $\lambda_2\Pi_2$ . On the other hand, if  $(1 - \lambda_2)\Pi_2 > \Pi_1$  and seller 1 makes the offer, then seller 1 maximizes its payoff,  $T_{10}$ , subject to  $T_{11} \geq c_1$  and condition (5) by choosing  $T_{11} = c_1$  and  $T_{10} = \frac{\lambda_2\Pi_1}{(1-\lambda_2)}$ , giving seller 1 an expected payoff in this case of  $\frac{\lambda_2\Pi_1}{(1-\lambda_2)}$ , the buyer an expected payoff of  $(1 - \lambda_2)\Pi_2$ , and seller 2 an expected payoff of  $\lambda_2\Pi_2 - \frac{\lambda_2\Pi_1}{(1-\lambda_2)}$ .

Summing the expected payoffs in the various cases for each player when seller 2 is efficient and below-cost pricing is infeasible, and taking into account the probability that seller 1 makes the offer in stage one, yields the equilibrium expected payoffs given in Table 1 below.<sup>17</sup>

Table 1: Equilibrium expected payoffs

cond'n	$\Pi_1 < (1 - \lambda_2)\Pi_2$	$(1 - \lambda_2)\Pi_2 \leq \Pi_1 \leq \Pi_2$
buyer	$(1 - \lambda_2)\Pi_2 + \lambda_2(1 - \lambda_1)\Pi_1$	$(1 - \lambda_2)\Pi_2 + \lambda_2(1 - \lambda_1)\Pi_1$
seller 1	$\frac{\lambda_1\lambda_2}{1-\lambda_2}\Pi_1$	$\lambda_1\lambda_2\Pi_2$
seller 2	$\lambda_2\Pi_2 - (\frac{\lambda_1\lambda_2}{1-\lambda_2} + \lambda_2(1 - \lambda_1))\Pi_1$	$\lambda_2(1 - \lambda_1)(\Pi_2 - \Pi_1)$

Consistent with Proposition 4, Table 1 shows that seller 2 does not always earn higher payoff with more bargaining power. In particular, if  $\Pi_2 > \Pi_1$ ,  $\lambda_1 = 1$ , and  $\lambda_2 > 0$ , then all surplus is extracted from seller 2 if and only if  $\lambda_2 \geq \bar{\lambda}_2$ , where  $\bar{\lambda}_2 \equiv (\Pi_2 - \Pi_1)/\Pi_2$ . This implies that when seller 2's surplus is not fully extracted, non-local increases in  $\lambda_2$  to a value above  $\bar{\lambda}_2$  cause seller 2's payoff to decrease from something positive to zero. The comparative static for local increases in  $\lambda_2$  for all  $\lambda_2 < \bar{\lambda}_2$  is given in the following proposition (the proof follows by differentiating the expected payoff expressions in Table 1 with respect to  $\lambda_2$ ).

**Proposition 5** *Seller 2's expected payoff is decreasing in its own bargaining power when below-cost pricing is infeasible,  $\Pi_2 > \Pi_1$ ,  $\lambda_2 < \bar{\lambda}_2$ , and  $\frac{(1-\lambda_2)^2}{\lambda_1+(1-\lambda_1)(1-\lambda_2)^2} < \frac{\Pi_1}{\Pi_2}$ . In contrast, the buyer's equilibrium expected payoff is always decreasing in the bargaining power of seller 2.*

We illustrate the first result in Figure ??, where the lines drawn are seller 2's expected payoff as a function of its own bargaining power for four different values of seller 1's bargaining power. The figure shows that if seller 1's bargaining power is sufficiently large, there exist parameters such that seller 2's expected payoff is decreasing in its own bargaining power.

To better understand this result, assume  $(1 - \lambda_2)\Pi_2 > \Pi_1$ , so that full extraction from seller 2 is not possible, and notice that the additional surplus available for the buyer and seller 2 to divide in stage two is  $\Pi_2 - T_{10}$ , which is equal to  $\Pi_2$  if the buyer made the offer in stage one and  $\Pi_2 - \frac{\lambda_2}{1-\lambda_2}\Pi_1$  if seller 1 made the offer in stage one. Thus, the expected

<sup>17</sup>For details on the derivation of the payoffs in Table 1, see the Appendix.

surplus available to be divided in stage two is  $(1 - \lambda_1)\Pi_2 + \lambda_1(\Pi_2 - \frac{\lambda_2}{1-\lambda_2}\Pi_1) = \Pi_2 - \frac{\lambda_1\lambda_2}{1-\lambda_2}\Pi_1$ . The higher is seller 2's bargaining power, the larger is its expected share of this surplus, but notice that the expected surplus is *decreasing* in seller 2's bargaining power. So even though higher bargaining power gives seller 2 a larger share of the surplus, it decreases the surplus available for it and the buyer to divide in stage two. As Proposition 5 shows, seller 2 may be worse off depending on which effect dominates, and this depends on the parameter values.<sup>18</sup>

The second result is more intuitive. The buyer is always worse off with an increase in seller 2's bargaining power because both effects described above operate on its equilibrium expected payoff in the same direction: the buyer receives a smaller share of a smaller surplus.

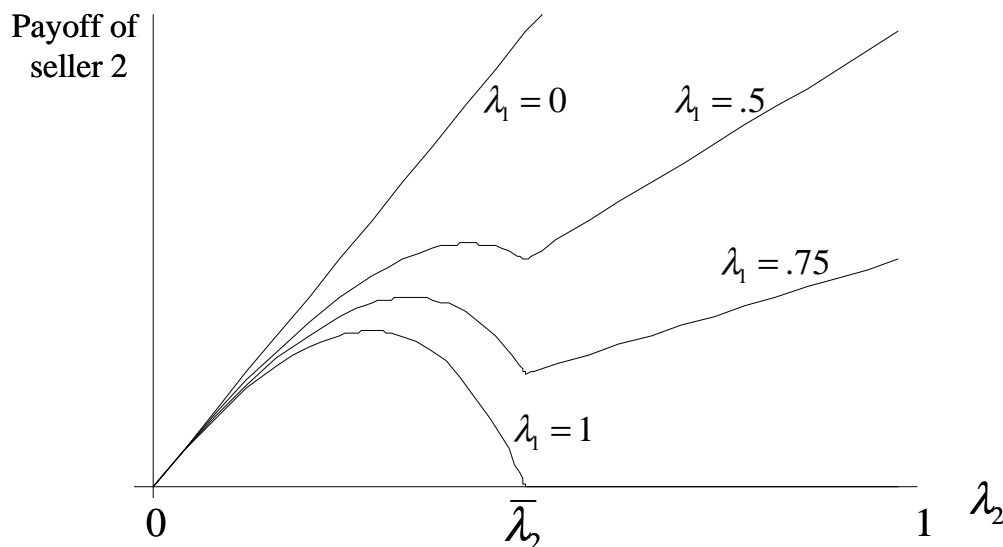


Figure 1: Seller 2's payoff as a function of  $\lambda_2$  for different values of  $\lambda_1$ .

The next proposition considers the effect of an increase in seller  $i$ 's bargaining power on seller  $j$ 's expected payoff,  $i, j \in \{1, 2\}$ ,  $j \neq i$ . The surprising result in this case is that the sellers' preferences are not symmetric. Although seller 1 weakly prefers that seller 2 have *more* bargaining power, seller 2 weakly prefers that seller 1 have *less* bargaining power.

<sup>18</sup>Seller 2's expected payoff is decreasing in its own bargaining power for a larger range of parameter values the larger is seller 1's bargaining power. This follows because the buyer's expected payoff is decreasing in  $\lambda_1$  and  $\lambda_2$ , and the cross derivative is negative. Thus, the relative gain from an increase in seller 2's share of the rent is decreasing in seller 1's bargaining power, and therefore capturing a larger share of a smaller rent is more likely to lead to a decrease in seller 2's payoff when seller 1's bargaining power is large than small.

**Proposition 6** *Seller 1's expected payoff is weakly increasing (strictly if  $\lambda_1 > 0$ ) in seller 2's bargaining power. In contrast, when below-cost pricing is infeasible, seller 2's expected payoff is weakly decreasing (strictly if  $\lambda_2 > 0$  and  $\Pi_2 > \Pi_1$ ) in seller 1's bargaining power.*

Seller 1 prefers that seller 2 have more bargaining power (and thus that the buyer have less bargaining power) in the stage-two negotiation because the buyer's disagreement payoff with seller 1 is  $(1 - \lambda_2)\Pi_2$ , which is smaller when seller 2 has more bargaining power. In contrast, an increase in seller 1's bargaining power increases the likelihood that the buyer and seller 1 can jointly extract all of seller 2's surplus (depending on parameters, extraction may be full when  $\lambda_1 = 1$ , but not when  $\lambda_1 < 1$ ) thereby decreasing seller 2's expected payoff.

Since the expected amount of rent extraction is increasing in the first seller's bargaining power, it remains to be seen whether the buyer and first seller both gain when  $\lambda_1$  increases, or whether the gains accrue only to one player. The next proposition implies that the latter holds because the two players differ in whether or not they prefer that seller 1's bargaining power increase. Seller 1 prefers that it increase, but the buyer prefers that it decrease.

**Proposition 7** *When below-cost pricing is infeasible and  $\Pi_2 > \Pi_1$ , seller 1's expected payoff is weakly increasing (strictly if  $\lambda_2 > 0$ ) in its own bargaining power, whereas the buyer's expected payoff is weakly decreasing (strictly if  $\lambda_2 > 0$ ) in seller 1's bargaining power.*

Seller 1 gains from an increase in its bargaining power because this allows it to capture a larger share of a larger joint payoff with the buyer. On the other hand, the buyer's expected payoff is weakly decreasing in seller 1's bargaining power. To understand this, note that although surplus extraction is increasing in  $\lambda_1$  when below-cost pricing is infeasible, all of the additional gains accrue to seller 1 (when seller 2 is efficient, all equilibrium contracts have  $T_{11} = c_1$ , and so increases in surplus extraction arise only through increases in  $T_{10}$ , which accrue solely to seller 1). Thus, the buyer is left with a smaller share of a fixed payoff.

## 4 Applications and Extensions

We have thus far considered the case of a single buyer negotiating in sequence with two potential sellers, a setup we chose in order to facilitate comparison with Aghion and Bolton's (1987) seminal work on rent extraction. In this section, we begin by showing that our results also extend to the case of a single seller negotiating in sequence with two potential buyers.

To see that this case is isomorphic, label the buyers as buyer 1 and buyer 2 and assume that each buyer has unit demand and the seller has at most one unit to sell. We let  $\Pi_i \equiv$

$R_i - c_i$  denote the overall joint payoff of the three players if the seller sells to buyer  $i$ , where  $R_i$  is the utility received by buyer  $i$ , zero is received by buyer  $j$ , and  $c_i$  is the seller's cost.

The game consists of three stages. In stage one, the seller and buyer 1 negotiate contract  $\tilde{T}_1$ . The contract specifies a payment  $\tilde{T}_{11}$  from buyer 1 to the seller if the buyer purchases the seller's unit and a payment  $\tilde{T}_{10}$  from buyer 1 to the seller if the buyer does not purchase from the seller. In stage two, the seller and buyer 2 negotiate contract  $\tilde{T}_2$ . The contract specifies payments  $\tilde{T}_{22}$  and  $\tilde{T}_{20}$ . In stage three, the seller sells to at most one buyer.

The seller can not sell to a buyer with whom it has no contract. If a buyer has no contract with the seller, its payoff is zero. If buyer  $i$  has a contract with the seller, its payoff is  $R_i - \tilde{T}_{ii}$  if the seller sells to him, and  $-\tilde{T}_{i0}$  otherwise. The seller's payoff is  $\tilde{T}_{ii} + \tilde{T}_{j0} - c_i$  if it sells to buyer  $i \neq j$ , where  $\tilde{T}_{j0} = 0$  if the seller has no contract with buyer  $j$ . The seller's payoff if it does not sell to a buyer is  $\tilde{T}_{10} + \tilde{T}_{20}$ , where  $\tilde{T}_{i0} = 0$  if the seller has no contract with buyer  $i$ .

As in the case with one buyer, we assume a simple non-cooperative bargaining game in which in each negotiation one player makes a take-it-or-leave-it offer to the other, and we equate a player's bargaining power with the probability with which it gets to make the offer.

Given this set-up, our results hold by replacing  $R_i$  with  $-c_i$ ,  $c_i$  with  $-R_i$ ,  $T_{ii}$  with  $-\tilde{T}_{ii}$ , and  $T_{j0}$  with  $-\tilde{T}_{j0}$ , where appropriate, and replacing 'seller 1' with 'buyer 1,' 'seller 2' with 'buyer 2,' 'the buyer' with 'the seller,' and so forth. Thus, for example, the seller purchases from the efficient buyer in all SPE when below-cost pricing is feasible, the contract between the seller and first buyer may sometimes contain breakup fees, and when below-cost pricing is infeasible, the second buyer's payoff may sometimes be decreasing in its bargaining power.

We now turn our attention to some applications of the model. There are many real-world situations in which buyers and sellers with interdependent payoffs negotiate sequentially. Examples include mergers and acquisitions in which the takeover target negotiates first with one possible acquirer and then another, labor markets in which an employee must decide whether to leave her current job for another, goods markets in which a buyer negotiates in sequence with two potential suppliers of an input, and sports markets in which a coach who is under contract with one team negotiates for possible employment with a second team, or a team that is located in one city negotiates with a new city for possible relocation.<sup>19</sup>

We have shown that the common player to both negotiations can sign a contract in the first negotiation that allows it and the first player to extract surplus from the second player.

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<sup>19</sup>Our assumption that the common player trades with only one of the other two players although it may have contracts with both, is natural in these settings: a takeover target is acquired by one firm, an employee has one full-time job, a person has one spouse, a coach coaches one team, and a team bears one city's name.

For example, in mergers and acquisitions, when a firm negotiates with one potential acquirer, it might agree to pay a break-up fee if it later rejects that offer in favor of an acquisition offer from another firm.<sup>20</sup> These break-up fees reduce the surplus available to the second acquirer because if it does succeed in acquiring the firm, it also acquires the obligation to pay the break-up fee to the first potential acquirer. In other examples,<sup>21</sup> the contractual features that may allow surplus extraction include non-compete clauses, liquidated damages, long-term contracts, pre-nuptial agreements, and non-refundable security deposits or downpayments.

In the rest of this section, we apply our results to the examples mentioned above.

## Mergers and acquisitions

It is common in mergers and acquisitions for firms to negotiate a break-up fee to be paid by the acquisition target to the acquiring firm should the target receive and accept a competing offer.<sup>22</sup> Most commonly, these break-up fees are payable only if the target is acquired by another firm, but in some cases they are payable whenever the acquisition fails to occur. For example, the pharmaceutical company Pharmacia & Upjohn Inc. agreed to pay Monsanto Co. a \$575 million break-up fee if their \$27 billion merger agreement was canceled or if Pharmacia & Upjohn accepted a “superior offer.”<sup>23</sup> And in negotiations between investment firms Jostens Inc. and Investcorp SA, Jostens agreed to pay Investcorp a \$19 million break-up fee if it were to accept a third-party takeover bid (*Federal Filings Newswires*, 4/10/2000).

Sometimes these break-up fees are actually paid. For example, insurer American General paid \$600 million to Prudential when American General rejected Prudential’s takeover bid

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<sup>20</sup>The pharmaceutical and health care products company American Home Products (AHP) received a break-up fee of \$1.8 billion when Warner-Lambert canceled its merger with AHP and merged instead with Pfizer (*The Wall Street Journal*, 02/07/2000, A3). Newport News Shipbuilding Inc.’s agreement to pay General Dynamics a break-up fee of \$50 million affected negotiations with another potential acquirer, Northrop Grumman Corp., reducing the surplus available to Northrop in the event that it acquired Newport News (*The New York Times*, 5/10/2001, C7). Yet another example of a break-up fee is the \$600 million breakup fee paid by insurer American General to Prudential (*The Wall Street Journal*, 05/29/2001, C2).

<sup>21</sup>In goods markets, a buyer may have to pay damages to a seller if the relationship ends. In real-estate markets, non-refundable security deposits may be observed depending on whether the market favors buyers or sellers. In sports markets, although a team may gain some leverage in trade talks with another team when it must compensate players who are traded, the team would prefer to gain leverage by paying low salaries. Nevertheless, players who have enough bargaining power are routinely able to negotiate ‘trade-kicker’ clauses.

<sup>22</sup>These contractual provisions found in takeovers are also known as target-termination fees. Officer (2002) shows that, in recent years, approximately 60% of acquisition contests involve the use of target-termination fees, which are on average approximately 5% of the market value of the target firm’s equity. Reverse break-up fees, in which penalties are paid by buyers who do not consummate a deal with a given seller (e.g., because there is a better match with another seller) are also becoming common (*www.sourcemia.com* 4/2/2007).

<sup>23</sup>Schedule 13D filed by Pharmacia & Upjohn, Inc. on 12/29/1999 (SEC Document 0000898822-99-00718).

and agreed instead to merge with AIG, the world's largest insurer (*The Wall Street Journal*, 5/29/2001, C2). However, sometimes no breakup fees are negotiated. In the oil exploration and production company Royal Dutch/Shell Group's attempt to takeover Barrett Resources, Royal Dutch agreed to a binding merger agreement but still permitted Barrett to seek better offers for a period of time without a break-up fee (*The New York Times*, 3/29/2001, C4).

Our results imply that we should see break-up fees negotiated whenever the first potential acquirer has bargaining power with respect to the target firm,<sup>24</sup> and that these fees will be paid whenever the second potential acquirer turns out to be a better match in the sense of creating greater value through acquisition than would the first potential acquirer. Our results also imply that the first potential acquirer will be better off the more bargaining power it has, and the more bargaining power the second potential acquirer is perceived to have, while the second acquirer will prefer that the first acquirer have less bargaining power. The second acquirer may even prefer that its own bargaining power be less, e.g., the less bargaining power AIG is perceived to have, the greater incentive American General has to reject an offer from Prudential that involves a break-up fee (because its perceived ability to negotiate a good deal with AIG is higher), thus increasing the value to AIG of acquiring it.

## **Labor markets**

Labor market contracts often contain non-compete clauses that preclude employees from taking jobs at competing firms for a period of time after leaving their current job. Sometimes these firms compensate their rival to obtain the employee's release. For example, although there was not an explicit non-compete agreement, chip manufacturer Motorola Inc. extracted a settlement from Intel Corp. when Motorola executive Mark McDermott and fifteen other Motorola employees left Motorola to take jobs at Intel (*Wall Street Journal*, 5/3/1999, B6).<sup>25</sup>

Our results imply that we should see non-compete clauses in labor contracts when an employer can make take-it-or-leave-it offers with respect to its employees, but that we should nonetheless see employees leaving when their employment is more valuable elsewhere, with the non-compete clause imposing costs on the new employer. Because the non-compete clause effectively extracts surplus from the new employer, our results also imply that the original employer will prefer that other potential employers have all the bargaining power

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<sup>24</sup>Since the most likely takeover targets are typically in some type of financial distress, it is not surprising that one tends to observe break-up fees in acquisition contests. In general, we would expect a firm facing a financial crisis to be less patient to finalize a merger deal than one that remains a viable entity on its own.

<sup>25</sup>As pointed out by a referee, however, if break-up fees are infeasible, then non-compete clauses can actually prevent efficient job changes, contrary to our efficiency result in Proposition 1.

with respect to the employee because then the employee's outside options are poor and so the employee is more willing to accept a contract that includes a lengthy non-compete provision.

### Sports and celebrities markets

There are many examples in which sports teams offer "guaranteed contracts" to their head coaches.<sup>26</sup> Once in place, the coach may still be able to still switch teams, but in order to sign on with another team, the new team must buy the coach's way out of the old contract. For example, when the Kansas City Chiefs hired football coach Dick Vermeil, who was still under contract with the St. Louis Rams, the Chiefs had to forfeit two draft picks and \$500,000 in exchange for Vermeil's release from his contract (*Associated Press Newswires*, 1/13/2001). Similarly, the Tampa Bay Buccaneers had to forfeit four draft picks and \$8 million to hire football coach Jon Gruden away from the Raiders (*USA Today*, 2/19/2002), and the University of Michigan paid West Virginia \$4 million to let Rich Rodriguez's walk from his contract and coach the Wolverines (*Associated Press Newswires*, 12/16/2007).<sup>27</sup>

In the above examples, the original team can be thought of as the first player, and the coach can be thought of as the common player. On the other hand, athletes often have "trade-kicker" clauses in their contracts which compensate them in the form of a lump-sum payment in the event they are traded to a new team (for example, Chris Webber, a basketball player for the Sacramento Kings, has a 15% trade-kicker clause in his contract if he is traded (*Associated Press Newswires*, 7/20/2001)). In these examples, the athlete can be thought of as the first player and the athlete's original team can be thought of as the common player.<sup>28</sup>

Our results have some interesting implications for the effect of guaranteed contracts on an athlete's incentive to perform prior to becoming a free-agent. Suppose a baseball team currently has a shortstop, but knows that a better shortstop will soon become available. The team might try to arrange its roster in such a way that it would be able to accommodate the new player even though cutting the current shortstop from the team would require that it forfeit the guaranteed portion of the current shortstop's compensation. During the

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<sup>26</sup>Related examples include movie stars and their studios and musicians and their record labels.

<sup>27</sup>Similar examples can be found in other sports, and sometimes active players are involved in the compensation for the coach. For example, when the Tampa Bay Devil Rays hired baseball coach Lou Piniella, Piniella was still under contract with the Seattle Mariners, and so the Devil Rays had to give up all-star center fielder Randy Winn to obtain Piniella's release from his contract (*Sarasota Herald-Tribune Co*, 10/29/2002).

<sup>28</sup>This is also similar to the penalty clauses that sports figures and celebrities negotiate if their employers 'change' their mind. For example, NBC must pay Conan O'Brien a \$40 million penalty if it fails to install O'Brien as the *Tonight Show* Host (*Associated Press Newswires*, 5/12/2008), and similarly, Florida State University must pay Jimbo Fisher a \$2.5 million penalty if it fails to let him take over as Florida State's new head coach when the current coach, Bobby Bowden, retires (*Associated Press Newswires*, 12/10/2007).

period when teams are making adjustments so that they would be able to compete for the free agent, the future free agent might be better off not having a star season, if having an exceptional season causes some teams to invest more in their current players, thinking that the free agent will be too expensive for their roster. The trade-off facing the free-agent is that having a star season may allow him to command a higher salary among the teams with which he negotiates, but the number of teams in the market for his services may be fewer as a result of his successes. That is, the free-agent coming off a star season may command a larger share of the available economic surplus, but the economic surplus itself (which includes non-pecuniary factors such as having the option of playing for any team) may be smaller.

### **Goods markets**

It is not uncommon for a buyer to negotiate an exclusive dealing contract with one of its suppliers. For example, a hardware store might carry only one line of kitchen cabinets, an electronics store might carry only one brand of amplifiers, or a bike shop might carry only one line of bicycles. A computer manufacturer might use exclusively Intel's processor or exclusively Microsoft's operating system. Breach of such contracts often involve the payment of liquidated damages or the invocation of an explicit penalty clause in the contract. For example, prior to 1995, Microsoft negotiated "per-processor licensing" provisions in contracts with PC manufacturers requiring them to pay for the Windows operating system on all their machines even if some were sold without it (*The Wall Street Journal*, 6/24/1999, B16).

In input markets, bargaining power may depend on such things as the suppliers' options for other retail outlets in a geographic area, the importance of an individual supplier's product for attracting customers to the retail location, the supplier's capital structure, whether the supplier has excess capacity, discount rates, and risk aversion. Our results suggest that a supplier will want to manipulate these factors to its advantage, but that the way it will want to manipulate them may depend on the order in which it negotiates with the retailer.

## **5 Conclusion**

This paper shows that one's intuition about surplus extraction and the role of bargaining power can be misleading in cases of sequential contracting because the economic rent in the negotiations between the buyer and each seller is not fixed. If the economic rent were fixed, a player would always be better off with more bargaining power. Instead, in our model, a seller's bargaining power affects the outcome of the negotiation between the buyer and other

seller, which in turn affects how much surplus is available for the seller to capture in its own negotiation. Thus, the two components that determine how much a seller can earn, the extent of its bargaining power and the buyer's joint payoff with it, are not independent.

We obtain a number of results that contrast with those typically obtained in Rubinstein-Ståhl models of bargaining and in models in which one player in each bilateral negotiation has all the bargaining power. For example, in our model the buyer and first seller may not be able to extract all the surplus from the second seller even when there is perfect information, and the second seller's expected payoff can be *decreasing* in its own bargaining power. Furthermore, we show that each seller's bargaining power may affect the expected payoff of the other seller even though the sellers do not negotiate directly with one another. The seller negotiating first will prefer that the second seller have more bargaining power, but the seller negotiating second will prefer that the first seller have less bargaining power.

These results have immediate implications for ongoing policy considerations. Since the first seller is unambiguously worse off when its own bargaining power decreases, and unambiguously worse off when the bargaining power of the second seller decreases, it follows that an exogenous increase in the buyer's power will unambiguously harm the first seller. Note, however, that the second seller actually gains when the buyer's bargaining power increases vis a vis the first seller, and in some environments also gains when its own bargaining power decreases. This implies, of course, that the second seller need not always fear an increase in buyer power; in some cases it benefits. This has policy relevance because it is often asserted that buyer power can be harmful in that when facing powerful buyers, suppliers may "reduce investment in new products or product improvements, advertising and brand building," to the detriment of consumers (European Commission, 1999, p. 4). Of course, if suppliers do not necessarily lose from an increase in buyer power, as our results suggest, then the presumptions that underlie the assertion need not hold, and the opposite effect could occur.

We have also shown that our results extend to the isomorphic case of a single seller negotiating in sequence with two potential buyers. Among other things, this suggests that we should sometimes observe break-up fees in contracts between buyers and sellers if the seller trades with another buyer. Such fees are commonly found in mergers and acquisitions, where firms often negotiate a breakup fee to be paid by the acquisition target to the acquiring firm should the target receive and accept a competing offer,<sup>29</sup> and in labor market contracts,

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<sup>29</sup>For example, Adelphia Communications Corp. agreed to pay Time Warner and Comcast a combined \$440 million in break-up fees if the sale of its cable systems did not go through (David Elman, "Adelphia gets OK on revised fee," *Daily Deal/The Deal*, June 20, 2006), and Ripplewood Holdings offered to purchase Maytag Corp., but received a break-up fee of \$40 million when Maytag was instead purchased by Whirlpool

break-up fees can be found implicitly in non-compete clauses that preclude employees from taking jobs at competing firms within some period of time of leaving their current job.

Our result that the second seller's expected payoff can be decreasing in its own bargaining power raises the question of whether the second seller might attempt ex-ante to reduce its bargaining power. For this to work, the action of the second seller must be costly to reverse because ex-post, at the time of the second negotiation, the second seller would always prefer to have more bargaining power rather than less. Concerns about the credibility of the second seller's commitment to lower bargaining power may thus prevent this type of manipulation of bargaining power from being effective. One way to think about our result is that there are circumstances in which the second seller wants to commit to share its negotiation surplus with the buyer. Credibly reducing its bargaining power is one way, but there may be other means or conventions that can achieve the same thing, e.g., our model suggests that a seller might want to develop a reputation for sharing some of the joint surplus with the buyer.

Our result that the payoff of the first seller is increasing in the bargaining power of the second seller raises the question of whether the first seller might be able to do something, possibly at a cost to itself, that would increase the second seller's bargaining power. For example, a seller might be able to contribute to an industry organization or share information that increases the bargaining power of the other seller. Our results suggest that an inefficient seller would offer to support an efficient seller in an industry if such support could increase the efficient seller's bargaining power, but that efficient sellers (and buyers) would not offer such support, preferring instead to reduce the bargaining power of an inefficient seller.

Although we focus on the case with discrete quantities in which the buyer purchases at most one unit of the good, we can show that our main results extend to the case of continuous quantities, general cost functions, and any degree of substitution and complementarity between the sellers' products. In particular, we can show that our efficiency and comparative statics results continue to hold. Thus, the basic insight that the distribution of bargaining power affects multi-lateral negotiations in different ways than bilateral negotiations is robust.

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Corp. (Brenon Daly, "Maytag deal: Up to you, Whirlpool," *Daily Deal/The Deal*, August 23, 2005).

## A Appendix

*Proof of Lemma 1.* Seller 2 is clearly indifferent between accepting  $T_2^b$  and not. Thus, it is a best reply for seller 2 to accept contract  $T_2^b$ . Given this, one can easily show that it is a best reply for the buyer to offer  $T_2^b$ .

If  $T_1$  satisfies  $\max\{\Pi_2 - T_{10}, -T_{10}\} < R_1 - T_{11}$ , then the buyer's maximum payoff from purchasing from seller 2 is less than its payoff from purchasing from seller 1, and the buyer's payoff from purchasing nothing is less than its payoff from purchasing from seller 1. It follows that in any equilibrium the buyer purchases from seller 1 and pays nothing to seller 2.

Now assume  $T_1$  satisfies

$$\max\{R_1 - T_{11}, -T_{10}\} < \Pi_2 - T_{10}, \quad (\text{A1})$$

and let  $\varepsilon \in (0, \Pi_2 - T_{10} - \max\{R_1 - T_{11}, -T_{10}\})$ . Note that if the buyer offers the contract  $T_2^\varepsilon$  defined by  $T_{22}^\varepsilon \equiv c_2 + \varepsilon$  and  $T_{20}^\varepsilon \equiv 0$ , then the buyer strictly prefers to purchase from seller 2 because its payoff by doing so is  $\Pi_2 - T_{10} - \varepsilon > \max\{R_1 - T_{11}, -T_{10}\}$ , and seller 2 strictly prefers to accept the contract because it receives payoff  $\varepsilon > 0$ . Letting  $\varepsilon$  approach zero, in every equilibrium of the continuation game the buyer must receive payoff at least  $\Pi_2 - T_{10}$ . If the buyer does not purchase from seller 2, it gets at most  $\max\{R_1 - T_{11}, -T_{10}\}$ , which is less than  $\Pi_2 - T_{10}$  by (A1). Thus, in any equilibrium of the continuation game, seller 2 accepts the buyer's contract, the buyer purchases from seller 2, and the buyer pays seller 2 an amount  $c_2 = T_{22}^b$ . Q.E.D.

*Proof of Lemma 2.* If  $T_1$  satisfies  $\max\{\Pi_2 - T_{10}, -T_{10}\} < R_1 - T_{11}$ , then the buyer's maximum payoff from purchasing from seller 2 is less than its payoff from purchasing from seller 1, and the buyer's payoff from purchasing nothing is less than its payoff from purchasing from seller 1. It follows that in any equilibrium the buyer purchases from seller 1 and pays nothing to seller 2. Nevertheless, it remains a best reply for seller 2 to offer contract  $T_2^s$ .

If  $\max\{R_1 - T_{11}, -T_{10}\} = \Pi_2 - T_{10}$ , then the buyer is indifferent between accepting  $T_2^s$  and purchasing from seller 2 and not because in either case the buyer has payoff  $\max\{R_1 - T_{11}, -T_{10}\}$ . Thus, it is a best reply for the buyer to accept contract  $T_2^s$  and to purchase from seller 2. Given this, it is straightforward to show that it is a best reply for seller 2 to offer contract  $T_2^s$ .

Finally, assume  $\max\{R_1 - T_{11}, -T_{10}\} < \Pi_2 - T_{10}$ . Then  $T_{22}^s(T_1) > c_2$  and we can let  $\varepsilon \in (0, T_{22}^s(T_1) - c_2)$ . Note that if seller 2 offers the contract  $T_2^\varepsilon$  defined by  $T_{22}^\varepsilon(T_1) \equiv T_{22}^s(T_1) - \varepsilon$

and  $T_{20}^\varepsilon \equiv 0$ , then the buyer strictly prefers to accept the contract and purchase from seller 2 because its payoff by doing so is  $\max\{R_1 - T_{11}, -T_{10}\} + \varepsilon$ , which is strictly larger than its payoff from rejecting seller 2's contract or accepting it and not purchasing from seller 2. Thus, if seller 2 offers contract  $T_2^\varepsilon$ , its payoff is  $T_{22}^\varepsilon(T_1) - c_2$ . Letting  $\varepsilon$  approach zero, in every equilibrium of the continuation game seller 2 must receive payoff at least  $T_{22}^s(T_1) - c_2$ , and, by the assumption that  $T_{22}^s(T_1) > c_2$  and the arguments above, this can only be achieved in an equilibrium of the continuation game if the buyer accepts seller 2's contract, purchases from seller 2, and pays seller 2 an amount  $T_{22}^s(T_1)$ . Q.E.D.

*Proof of Proposition 1.* To establish the existence of an equilibrium, first consider the case in which the buyer makes the offer in stage 1. Note that the buyer's maximum equilibrium payoff is  $\max\{\Pi_1, \Pi_2\}$ . If  $\Pi_1 \geq \Pi_2$ , then the buyer achieves its maximum payoff with an offer of  $T_{11} = c_1$  and  $T_{10} = 0$  in stage 1, followed by the continuation equilibria given in Lemmas 1 and 2. If  $\Pi_1 < \Pi_2$ , then the buyer achieves its maximum payoff with an offer of  $T_{11} \equiv R_1 - \Pi_2$  and  $T_{10} \equiv 0$  in stage 1, followed by the continuation equilibria given in Lemmas 1 and 2 and the specification that the buyer purchases from seller 2 when it is indifferent between purchasing from seller 1 and seller 2. In both cases, it is a best reply for seller 1 to accept the buyer's offer—it expects zero payoff in either case. This establishes the existence of equilibria when the buyer makes the offer in stage 1.

Now consider the case in which seller 1 makes the offer in stage 1. Note that seller 1's maximum equilibrium payoff is  $\max\{\Pi_1, \Pi_2\} - (1 - \lambda_2)\Pi_2$  because the buyer will reject seller 1's offer if it results in a payoff for the buyer of less than  $(1 - \lambda_2)\Pi_2$ . Suppose seller 1 offers the contract  $T_{11} = R_1 - (1 - \lambda_2)\Pi_2$  and  $T_{10} = \lambda_2\Pi_2$ . It is a best reply for the buyer to accept this offer because, using the continuation equilibria given in Lemmas 1 and 2, the offer gives the buyer payoff  $(1 - \lambda_2)\Pi_2$  regardless of whether it buys from seller 1 or seller 2. Furthermore, it is an equilibrium for the buyer to buy from seller 1 if and only if  $\Pi_1 \geq \Pi_2$  and from seller 2 if and only if  $\Pi_1 \leq \Pi_2$ . If  $\Pi_1 \geq \Pi_2$ , seller 1's payoff is  $\Pi_1 - (1 - \lambda_2)\Pi_2$  if  $\Pi_1 \geq \Pi_2$ , seller 1's payoff is  $\lambda_2\Pi_2$ , so seller 1 achieves its maximum payoff. This establishes the existence of equilibria when seller 1 makes the offer in stage 1.

To show that there are no equilibria in which the buyer purchases from an inefficient seller, assume  $\Pi_1 \neq \Pi_2$  so that one seller is inefficient. Using the arguments above, if the buyer makes the offer in stage 1, it can guarantee itself a payoff (arbitrarily close to)  $\max\{\Pi_1, \Pi_2\}$  (it can guarantee that seller 1 accepts its offer by offering  $T_{11} = c_1 + \varepsilon$  and  $T_{10} = \varepsilon$  for small, positive  $\varepsilon$ ). In an inefficient equilibrium, the buyer's payoff is bounded

above by  $\min \{\Pi_1, \Pi_2\}$ , which is less than  $\max \{\Pi_1, \Pi_2\}$ , so this cannot be an equilibrium. Similarly, using the arguments above, if seller 1 makes the offer in stage 1, it can guarantee itself a payoff (arbitrarily close to)  $\max \{\Pi_1, \Pi_2\} - (1 - \lambda_2)\Pi_2$ . In an inefficient equilibrium, seller 1's payoff is bounded above by  $\min \{\Pi_1, \Pi_2\} - (1 - \lambda_2)\Pi_2$ , which is less, so this cannot be an equilibrium. Q.E.D.

*Proof of Proposition 2.* Assume  $\Pi_2 > \Pi_1$ . By Proposition 1, the buyer purchases from seller 2. As shown in the proof of Proposition 1, if the buyer makes the offer in stage one it has payoff  $\Pi_2$ , which implies that it pays zero to seller 1. Also from the proof of Proposition 1, if seller 1 makes the offer in stage one, it has payoff  $\lambda_2\Pi_2$ , which implies that the buyer pays a break-up fee of  $\lambda_2\Pi_2$  to seller 1. Q.E.D.

*Proof of Proposition 3.* The proof of Proposition 1 implies that if below-cost pricing is feasible, seller 2 earns zero payoff in all SPE. To see this, note that if the buyer makes the offer in stage 1, the buyer's payoff is  $\max \{\Pi_1, \Pi_2\}$ , and if seller 1 makes the offer in stage 1, seller 1's payoff is  $\min \{\Pi_1, \Pi_2\} - (1 - \lambda_2)\Pi_2$  and the buyer's payoff is  $(1 - \lambda_2)\Pi_2$ . In either case, zero surplus remains for seller 2. Clearly, seller 2 earns zero payoff in all SPE if  $\lambda_2 = 0$  or if seller 2 is inefficient, in which case the buyer does not purchase from seller 2.

In the remainder of the proof, assume below-cost pricing is not feasible,  $\Pi_2 > \Pi_1$ , and  $\lambda_2 > 0$ .

Suppose the buyer makes the offer in stage one and  $\lambda_2 < 1$ . If the buyer offers  $T_{11} = c_1$  and  $T_{10} = 0$  and seller 1 accepts, then using Lemmas 1 and 2, the buyer has expected payoff of  $(1 - \lambda_2)\Pi_2 + \lambda_2\Pi_1$ . It is straightforward to show that seller 1 accepts the buyer's offer in any continuation equilibrium. Using  $\lambda_2 < 1$ , we have  $(1 - \lambda_2)\Pi_2 + \lambda_2\Pi_1 > \Pi_1$ , which implies that the buyer can achieve an expected payoff of  $(1 - \lambda_2)\Pi_2 + \lambda_2\Pi_1$  in equilibrium only if the buyer purchases from seller 2 and pays nothing to seller 1. This implies  $T_{10} = 0$ , and the restriction on below-cost pricing implies  $T_{11} \geq c_1$ , so using Lemma 2, when seller 2 makes the offer in stage two, its payoff is at least  $\Pi_2 - \Pi_1 > 0$ . Thus, seller 2's expected payoff is positive.

Now suppose instead that  $\Pi_1 < (1 - \lambda_2)\Pi_2$ . If the buyer makes the offer in stage one, then as above, seller 2's payoff is positive (note that the condition  $\Pi_1 < (1 - \lambda_2)\Pi_2$  implies  $\lambda_2 < 1$ ). Suppose seller 1 makes the offer in stage one and offers  $T_{11} = c_1$  and  $T_{10} = \frac{\lambda_2}{1 - \lambda_2}\Pi_1$  and the buyer accepts. Using Lemmas 1 and 2, seller 1 has payoff of  $\frac{\lambda_2}{1 - \lambda_2}\Pi_1$ . It is straightforward to show that the buyer accepts seller 1's offer in any continuation equilibrium. Because  $\lambda_2 > 0$ , seller

1's payoff is positive, which implies that the buyer must purchase from one of the sellers in any continuation equilibrium. Because the buyer rejects any stage one contract offer that gives it expected payoff less than  $(1 - \lambda_2)\Pi_2$ , if the buyer purchases from seller 1, then seller 1's payoff is bounded above by  $\Pi_1 - (1 - \lambda_2)\Pi_2 < 0$ , a contradiction. Thus, the buyer purchases from seller 2 and pays  $\frac{\lambda_2}{1-\lambda_2}\Pi_1$  to seller 1. This implies  $T_{10} = \frac{\lambda_2}{1-\lambda_2}\Pi_1$ , and the restriction on below-cost pricing implies  $T_{11} \geq c_1$ , so using Lemma 2, when seller 2 makes the offer in stage two, its payoff is at least  $\Pi_2 - \frac{1}{1-\lambda_2}\Pi_1 > 0$ . Thus, seller 2's expected payoff is positive.

Finally, we must complete the "only if" part of the proof. To see that seller 2's expected payoff is zero in at least some SPE if either the buyer makes the offer in stage one and  $\lambda_2 = 1$ , or  $\Pi_1 \geq (1 - \lambda_2)\Pi_2$ , see footnote 15 and the payoffs in Table A1 below. Q.E.D.

*Derivation of the payoffs in Table 1:* The payoffs in Table 1 follow from Lemmas 1 and 2, which are given in the text, and Lemmas A1 and A2, which are given below. Lemma A1 considers the case in which the buyer makes the offer in stage one, and Lemma A2 considers the case in which seller 1 makes the offer in stage one. The proofs of Lemmas A1 and A2 follow from arguments similar to those given elsewhere in the paper and are available from the authors on request.

For Lemma A1, define  $T_1^b$  by  $T_{11}^b \equiv c_1$  and  $T_{10}^b \equiv 0$ .

**Lemma A1** *If the buyer makes the offer in stage one, there is an equilibrium of the continuation game in which the buyer offers  $T_1^b$  and seller 1 accepts. If  $\Pi_1 = \Pi_2$ , then in any equilibrium, the buyer's payoff is  $\Pi_1$ . If  $\Pi_1 > \Pi_2$ , then in any equilibrium, the buyer purchases from seller 1 and pays  $T_{11}^b$  to seller 1 and zero to seller 2. If  $\Pi_2 > \Pi_1$  and  $\lambda_2 < 1$ , then in any equilibrium, the buyer purchases from seller 2, pays  $T_{10}^b$  to seller 1, and pays either  $c_2$  or  $R_2 - \Pi_1$  to seller 2, depending on whether the buyer or seller 2, respectively, makes the offer in stage two. If  $\Pi_2 > \Pi_1$ ,  $\lambda_2 = 1$ , and the buyer purchases from seller 2, then the buyer pays  $T_{10}^b$  to seller 1, and pays either  $c_2$  or  $R_2 - \Pi_1$  to seller 2 as before.*

For Lemma A2, define contract  $T_1^{s'}$  by  $T_{11}^{s'} \equiv R_1 - (1 - \lambda_2)\Pi_2$  and  $T_{10}^{s'} \equiv \lambda_2\Pi_2$ , and define the contract  $T_1^{s''}$  by  $T_{11}^{s''} \equiv c_1$  and  $T_{10}^{s''} \equiv \frac{\lambda_2}{1-\lambda_2}\Pi_1$ . Combining these two, define

$$T_1^s \equiv \begin{cases} T_1^{s'}, & \text{if } \Pi_1 \geq (1 - \lambda_2)\Pi_2 \\ T_1^{s''}, & \text{otherwise.} \end{cases}$$

**Lemma A2** *If seller 1 makes the offer in stage one, there is an equilibrium of the continuation game in which seller 1 offers  $T_1^s$  and the buyer accepts. If  $\Pi_1 = \Pi_2$ , then in any equilibrium, the buyer's payoff is  $(1 - \lambda_2)\Pi_2$ . If  $\Pi_1 > \Pi_2$ , then in any equilibrium, the buyer purchases from seller 1, pays  $T_{11}^{st}$  to seller 1, and pays zero to seller 2. If  $\Pi_2 > \Pi_1$ , then in any equilibrium, the buyer purchases from seller 2, pays  $T_{10}^s$  to seller 1, and pays either  $c_2$  (if the buyer makes the offer in stage two or  $\Pi_1 \geq (1 - \lambda_2)\Pi_2$ ) or  $R_2 - \frac{1}{1-\lambda_2}\Pi_1$  (if seller 2 makes the offer in stage two and  $\Pi_1 < (1 - \lambda_2)\Pi_2$ ) to seller 2.*

Lemmas 1, 2, A1, and A2 imply a SPE of the game is as follows: In stage one, if seller 1 makes the offer, it offers  $T_1^s$ , and if the buyer makes the offer, it offers  $T_1^b$ ; in both cases, the other player accepts. In stage two, if seller 2 makes the offer, it offers  $T_2^s(T_1^s)$  or  $T_2^s(T_1^b)$  depending on whether the stage-one contract is  $T_1^s$  or  $T_1^b$ , respectively, and if the buyer makes the offer, it offers  $T_2^b$ ; in all cases, the other player accepts. In stage three, the buyer purchases from seller 1 if  $\Pi_1 > \Pi_2$  and seller 2 otherwise. Furthermore, these Lemmas imply that the equilibrium payoffs are unique in any efficient SPE. We can calculate the equilibrium payoffs for the players as a function of which player makes the offer in each period. The calculations for the case with  $\Pi_1 > \Pi_2$  are straightforward. For  $\Pi_2 \geq \Pi_1$ , these payoffs are easily calculated using the equilibrium strategies and are given in the following table:

Table A1

Equilibrium payoffs for $\Pi_2 \geq \Pi_1$					
stage 1 offer by	seller 1			buyer	
condition	$(1 - \lambda_2)\Pi_2 \leq \Pi_1$	$(1 - \lambda_2)\Pi_2 > \Pi_1$		N/A	
stage 2 offer by	seller 2 or buyer	seller 2	buyer	seller 2	buyer
buyer	$(1 - \lambda_2)\Pi_2$	$\Pi_1$	$\Pi_2 - \frac{\lambda_2\Pi_1}{1-\lambda_2}$	$\Pi_1$	$\Pi_2$
seller 1	$\lambda_2\Pi_2$	$\frac{\lambda_2}{1-\lambda_2}\Pi_1$	$\frac{\lambda_2}{1-\lambda_2}\Pi_1$	0	0
seller 2	0	$\Pi_2 - \frac{\Pi_1}{1-\lambda_2}$	0	$\Pi_2 - \Pi_1$	0

Then one can use the probabilities with which the different players make the offers in each stage to calculate the expected payoffs given in Table 1.

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