Preliminary

Short-term, Long-term, and Continuing Contracts

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Abstract

Parties often write contracts that are neither long-term nor short-term, but rather are of indefinite duration in the sense that most of the time they roll over – we call these continuing contracts. We study the trade-off between long-term, short-term, and continuing contracts in a two period model where gains from trade are known to be present in the first period, and may or may not be present in the second period. A long-run contract that mandates trade in both periods is disadvantageous to the extent that renegotiation is required if there are no gains from trade in the second period. A short-term contract is disadvantageous to the extent that a new contract must be negotiated if gains from trade exist in the second period. A continuing contract can be a good compromise. We suppose that in a continuing contract there is no obligation to trade in the second period but if there are gains from trade the parties will bargain using the first period contract as a reference point – we interpret this as "bargaining in good faith". The use of the first contract as a reference point can reduce the cost of negotiating the next contract. Continuing contracts are not a panacea, however, since good faith bargaining may preclude the use of outside options in the bargaining process and as a result parties will sometimes fail to trade when this is efficient.

Key Words: short-term, long-term, continuing contracts.

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1.Introduction

A large literature in economics and law has studied why parties write long-term contracts. A leading explanation is that such contracts are useful to support specific investments, and there is much empirical support for this[1]. In a way it has been more challenging for economists to explain why parties write short-term contracts, that is, contracts that are shorter than the likely term of their relationship. The conventional answer is that it is costly for the parties to anticipate the contingencies that will arise during the latter part of their relationship and to write down unambiguously how to deal with them. However, as Maskin and Tirole (1999) have shown, if parties are fully rational, ingenious mechanisms can be used to get the parties to reveal information as their relationship progresses, and to incorporate this information into an enforceable contract. If there is even a reasonable chance that the parties' relationship will endure it is hard to see why, under classical assumptions, such mechanisms would not be used. Thus the question remains: why do parties write short-term contracts?

The purpose of this paper is to investigate this question and in doing so also to study another question that as far as we know has received little attention from economists or lawyers. Why do parties often write contracts that are neither long-term nor short-term, but rather are of indefinite duration in the sense that most of the time they roll over? Leading examples are rental contracts where the lease is typically renewed; month to month rental contracts with no lease; employment contracts where each party can (under some conditions) terminate the relationship, but where they usually do not – most of the time business continues "as usual". We call such contracts "continuing", although other terms are surely possible[2].

We make a distinction between continuing contracts and another type of contract that is observed in practice: a renewable contract. A renewable contract is one that continues if both parties agree. However, the terms under which the contract will be renewed are typically specified in advance: they may be the same as the terms of the initial contract, or they may be the terms that one of the parties is offering new contractors[3]. In contrast, we are interested in cases where the terms of the new contract are left open and can be adjusted according to new events (a worker's wage may stay the same most of the time but every so often he or she will get a raise; rents will typically change at the end of a lease, etc.). We will show that under some conditions a continuing contract is superior to a renewable contract.

To analyze continuing contracts we exploit the contracts as reference points approach (as in Hart and Moore (2008)). According to this approach one role of a contract is to get parties "on the same page",

[1] See Williamson (1975) and Klein et al. (1978). For empirical evidence, see Goldberg and Erickson (1987), Joskow (1987), Crocker and Masten (1988), Pirrong (1993), Brickley et al. (2006), and Bandiera (2007).

[2] We not describe them as "indefinite-term contracts" since lawyers already use the term indefinite to describe preliminary agreements that may not be enforceable. See Schwartz and Scott (2007).

[3] See Lafontaine and Shaw (1999). They note that when franchisees' contracts are renewed this is usually done at the "then-current" contract terms. Masten (2009) provides evidence on the value of long-term, renewable contracts for the case of heterogeneous freight transactions.

so as to avoid future misunderstanding. Misunderstanding leads to aggrievement and shading (in the form of departures from consummate performance), and consequent deadweight losses. Hart and Moore (2008) show that, under these conditions, Maskin-Tirole-type mechanisms lose their force and simple contracts can be optimal[4].

We adapt this approach to study the trade-off between long-term, short-term, and continuing contracts. We consider a model where a buyer and a seller can trade zero or one widgets in each of two periods. It is known that trade is efficient in the first period. If trade is always efficient in the second period a long-term contract mandating trade in both periods (specific performance) is optimal. (Our parties are risk neutral and there are no wealth constraints.) If trade is always inefficient in the second period a short-term contract specifying trade in the first period is optimal. But suppose that there is uncertainty about whether there are gains from trade in the second period. In this case neither a long-term contract nor a short-term contract achieves the first-best. A long-term contract can be renegotiated if it is learned that trade is inefficient at the beginning of the second period, but since the parties will argue about how to divide the gains from renegotiation this is costly. (Throughout we will assume that argument is costly because it leads to aggrievement and shading.) In the case of a short-term contract, if trade is efficient in the second period, the parties must negotiate a new contract from scratch and this is costly because the parties will argue about how to divide the gains from trade.

A continuing contract may be a good compromise. We interpret a continuing contract as one where there is no obligation to trade in the second period but if there are gains from trade the parties will bargain using the first period contract as a reference point. At the risk of being somewhat presumptuous we will use the expression "bargaining in good faith" to describe this[5]. Using the first period contract as a reference point can reduce negotiation costs since there is less to argue about. For example, suppose that in the first period the buyer's value of trade is 20, the seller's cost is 10 and the price is 15. At the beginning of the second period the parties learn that the buyer's second period value has increased to 24 and the seller's second period cost has increased to 12; that is, surplus has increased by 2. Using the first period contract as a reference point means that argument will be confined to how the additional surplus of 2 will be split. This means that the new price will lie between 17 (the buyer gets all the incremental surplus) and 19 (the seller gets all the incremental surplus). In contrast if the parties bargain from scratch, as in a short-term contract, all of the surplus is up for grabs, which means that the new price can be anywhere between 12 and 24.

[4] For some experimental evidence in support of the Hart-Moore theory, see Fehr et al. (2011), (2015). For some related field evidence, see Iyer and Schoar (2013).

[5] Bargaining in good faith is not a well-defined concept in the law. It can sometimes mean as little as that the parties must be willing to meet each other. However, it sometimes appears to mean considerably more. For example, Goldberg and Erickson (1987, footnote 29) describe a contract that was for three successive three-year terms. The contract stated that the parties could not terminate solely because the price was unsatisfactory without first engaging in good faith negotiation on the price. See Summers (1982) for a general discussion of good faith in contracts.

Although the use of the prior contract as a reference point can reduce argument/ bargaining costs and increase efficiency, this may not always be the case[6]. Consider the same situation as above, but suppose now that the seller has an outside option equal to 8 in period 2. We will argue that good faith *may* preclude this outside option from being used in the bargaining process. If the seller argues that she should be paid at least 20 in the second period this may be regarded as opportunistic or coercive since it cannot be justified on the basis of changes in value and cost within the relationship. Either the seller feels uncomfortable suggesting a price of 20 or the buyer is unwilling to go along with it; or, if it were to happen, B's aggrievement and shading would be so great that the seller would be worse off accepting the new terms than if she simply quit and took her outside option. The result may be that the relationship ends and the seller takes her outside option even though this is inefficient.

We do not wish to argue that outside options can never be taken into account in the bargaining process. Whether they can or cannot will depend on the circumstances. In an influential study, Kahneman et al. (1986), using telephone surveys, posed hypothetical situations to people to elicit their standards of fairness[7]. They found that people think that it can be fair for a firm to raise prices when its costs go up or to lower wages if it is losing money, but not fair for it to raise prices if its product becomes scarce or to lower wages if other workers are willing to work for less. This is very supportive of our assumption that using changes in value or cost within the relationship to justify a price change is consistent with good faith bargaining whereas using outside options is not. At the same time Kahneman et al. suggest that appealing to outside options may be more acceptable if these outside options represent general market trends. As they put it (p.730), "Some people will consider it unfair for a firm not to raise its wages when competitors are raising theirs. On the other hand, price increases that are not justified by increasing costs are judged less objectionable when competitors have led the way." We will therefore also consider the case where outside options *can* be used in bargaining[8]. By this we simply mean that in the above example the buyer will be willing to pay 20 (but not go above this) to keep the seller in the relationship if the seller's outside option is 8[9].

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[6] Hart and Moore (2008, Section V) consider the case where other parties' contemporaneous contracts, as opposed to the buyer's and seller's own prior contract, are reference points for the current transaction. This can also be beneficial or costly depending on the circumstances.

[7] Okun (1981) has emphasized the importance of fairness in determining firms' pricing decisions in what he calls "customer markets"(see Okun, p.154). He distinguishes between price increases based on cost increases, which are generally accepted as fair, and those based on demand increases, which are generally regarded as unfair (see Okun, p.170).

[8] This case is, of course, very familiar to academics: an employee gets an outside offer and asks his or her employer to match it and the employer does. But whether such behavior occurs, or is acceptable, can vary over time and with the industry or sector or country concerned. For example, in the case of academics matching outside options has been common in the U.S. for a long time, but was uncommon in the U.K. until fairly recently. For a dynamic analysis of the path of wages in a world where employers match outside options, see Harris and Holmstrom (1982).

[9] Note that, even if it is difficult or costly to use outside options in bargaining, alternative arrangements may be possible that substitute for this. For example, Weitzman (1984) and Oyer (2004) argue that firms may index wages to profit or share prices as a way to avoid inefficient quits or lay-offs. Our model assumes that verifiable variables that can form the basis of an index do not exist, although we return to the possibility of indexation in the conclusions.

However, one of the implications of our analysis that should be stressed is that, to the extent that outside options cannot be used in bargaining, good faith has costs as well as benefits, and that ex post inefficient allocations will sometimes occur in an optimal (continuing) contract[10].

We should emphasize that our analysis of good faith is not based primarily on what is legally enforceable. Parties may not be legally obliged to bargain in good faith in the absence of a formal contract (although they may be; see Schwartz and Scott (2007)). There may also be various legal notions of good faith that apply to a continuing relationship. We are as interested in the case where good faith in our sense is sustained by an informal understanding or norm to the effect that "this is how people should behave". We have mentioned Kahneman et al. (1986)'s findings on fairness. This paper also provides considerable support for the idea that past transactions serve as a reference point for future ones. At the same time the authors argue that past transactions do not form a reference point if the previous transaction was explicitly temporary, supporting the distinction we make between short-term and continuing contracts. Bewley (1999) consistently finds that while wages in the primary sector (long-term employment) are downward rigid, wages in the secondary sector (short-term positions) are flexible downward, again supporting our distinction between short-term and continuing contracts.

There is a large theoretical literature on the determinants of contract length, and we can mention only a few contributions. Some papers assume a fixed cost of writing a (possibly contingent) contract and derive contract length as a function of the volatility of the environment; see, e.g., Gray (1978) and Dye (1985). Harris and Holmstrom (1987) consider actual duration in a model where new information arrives but as they recognize there is no reason why the initial contract should not have infinite duration. Diamond (1991) argues that short-term contracts might be used by some borrowers to signal that they are of high quality and are willing to expose themselves to the hazards of renegotiation; he does not consider continuing contracts. MacLeod and Malcomson (1993), Che and Hausch (1999), and Segal (1999) identify situations where "no contract" achieves as good an outcome as a sophisticated (incomplete) contract, which can be interpreted as saying that long-term contracts are sometimes not needed; however, they also do not explain why continuing contracts are used.

Finally, Guriev and Krasov (2005) consider a situation where a seller makes a relationship specific investment and a buyer and seller can trade continuously over time. The buyer has an outside opportunity whose arrival time is stochastic; if it arrives it is efficient for the relationship to terminate. They show that it is optimal for parties to write what they call an evergreen contract – an indefinite contract which can be terminated by the buyer (at some cost) with notice. However, they do not consider what we have called continuing contracts where future terms are left open.

The paper is organized as follows. In Section 2 we present the model and analyze the trade-off between long-term, short-term, and continuing contracts for the case of no outside options. In Section 3 we bring in outside options and consider both the case where they can be used in bargaining and the case

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[10] Herweg and Schmidt (2014) have also shown that inefficient allocations can arise when contracts are reference points if parties are loss-averse. They are concerned with a one period model and do not study how a contract can be a reference point for future transactions.

where they cannot. In Section 4 we extend the analysis to other sorts of contracts, in particular, renewable and exclusive contracts. Finally, Section 5 concludes.

2. The Model

We consider a buyer B and a seller S engaged in a two period, three date relationship. See Figure 1 for a time-line. In each period they can trade zero or one widgets.

At date 0 B and S sign an initial contract that may be long-term, short-term, or continuing. This contract is negotiated under competitive conditions at date 0 in the sense that there are many alternative sellers for B and so each seller receives her outside option for the two periods, which we denote by $\bar{u}$. (One can imagine that B auctions off the initial contract to the potential sellers.) If the contract is long-term, it may be renegotiated at date 1. If the contract is short-term or continuing, a new contract between B and S may be negotiated at date 1 for the second period.

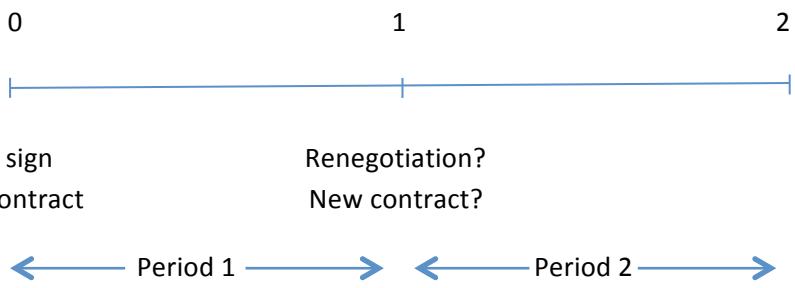


Figure 1

B's value v_1 and S's cost c_1 for the widget in period 1 are already known when the initial contract is written. We assume $v_1 > c_1$. At date 1, before the initial contract is renegotiated or a new contract is signed, B's value v_2, S's cost c_2, B's outside option r_B, and S's outside option r_S for period 2 are learned by both parties – there is symmetric information throughout (but v_2, c_2, r_B and r_S are not verifiable)[11]. Trade in period 2 is efficient if and only if $v_2 - c_2 > r_B + r_S$. At date 0, however, v_2, c_2, r_B and r_S are uncertain – they are drawn from a probability distribution F. Both parties are risk neutral, there are no wealth constraints, and without loss of generality we suppose no discounting. We assume that $\bar{u} = w_1 + Er_S$, where w_1 is S's first period outside wage and E stands for expectation. We also suppose $v_1 - c_1 > \bar{u} - Er_S$.[12] These assumptions ensure that B will always want to offer S a contract[13].

[11] If v_2, c_2, r_B and r_S were verifiable contingent contracts could be written and the problems that we study in this paper would not arise.

[12] We assume that B's and S's outside options in the second period do not depend on whether trade occurred in the first period.

For simplicity we assume that B has all the bargaining power in any negotiation or renegotiation at date 1.

Although bargaining at date 1 occurs under symmetric information it is not costless. We suppose that the parties have different feelings of entitlement concerning their payoff from bargaining and since at least one of them will be disappointed this leads to aggrievement and shading and consequently deadweight losses. We will explain the details of this below.

It is convenient to focus in this section on the case where there are no outside options at date 1 – $r_B \equiv r_S \equiv 0$. We introduce outside options in Section 3.

Long-term contract

Suppose first that the parties write a long-term contract at date 0, specifying trade in both periods (a specific performance contract). Without loss of generality we can assume the same price in each period, which we denote p. At date 1 the parties will learn v_2 and c_2. Obviously, if $v_2 > c_2$there are no gains from renegotiation. However, if $v_2 < c_2$, B and S *will* want to renegotiate.

Recall that we assume that B has all the bargaining power. Thus B will offer S an amount $(p - c_2)$ – her second period payoff under the existing contract – in return for not trading. However, following Hart and Moore (2008), we suppose that S feels entitled to more of the surplus from renegotiation – in fact she feels entitled to 100% of the surplus. (B also feels entitled to 100% of the surplus.)[14] In other words, S feels entitled to a payoff $p - v_2$ (which would make B's payoff $v_2 - p$, as under the specific performance contract). The difference between what S feels entitled to and what she receives, $c_2 - v_2$, represents S's aggrievement, A. As in Hart and Moore (2008), we suppose that S takes out her aggrievement on B by shading and this reduces B's payoff by $\theta A = \theta(c_2 - v_2)$, where $0 < \theta < 1$ is an exogeneous parameter. Shading does not affect S's payoff.

The bottom line is that, if $v_2 < c_2$, after renegotiation B's second period payoff $= c_2 - p - \theta(c_2 - v_2)$ and S's second period payoff $= p - c_2$. The deadweight losses from renegotiation $= \theta(c_2 - v_2)$[15].

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[13] We do not model the market for buyers and sellers at date 1. This would require a general equilibrium analysis in which there are several buyers and sellers at both dates 0 and 1 and the availability of alternative partners at date 1 depends on contracts signed at date 0. The outside options r_B and r_S are a crude and short-cut way of representing market alternatives at date 1.
We also do not model why the market is more competitive at date 0 than at date 1. In the background there may be some relationship-specific investments or other types of lock-in. Note, however, that the existence and extent of lock-in is captured implicitly. If $v_2 - c_2 > r_B + r_S$ with high probability, then this suggests significant lock-in. On the other hand, if $v_2 - c_2 \leq r_B + r_S$ with high probability, this suggests insignificant lock-in.

[14] Our results would not change significantly if each party felt entitled to a fraction α of the surplus, where $\frac{1}{2} < \alpha \leq 1$.

[15] One way S could shade is by being difficult, disagreeable or unresponsive during the renegotiation process (e.g., S could drag things out by not answering B's phone calls or emails promptly). Of course, such behavior could also

With these preliminaries out of the way, we can now turn to an optimal long-term contract. An optimal long-term contract maximizes B's expected payoff subject to S receiving at least $\overline{u}$. That is, it solves:

(2.1) $Max\ (v_1 - p) + \int_{v_2 > c_2} (v_2 - p) dF + \int_{v_2 \leq c_2} [c_2 - p - \theta(c_2 - v_2)] dF$

S.T.

(2.2) $(p - c_1) + \int (p - c_2) dF \geq \overline{u}.$

Obviously (2.2) holds with equality since (2.1) is decreasing in p. Letting U_B, U_S be B's and S's overall payoffs, respectively, and substituting (2.2) into (2.1) yields

(2.3) $U_B^{LT} = (v_1 - c_1) + \int_{v_2 > c_2} (v_2 - c_2) dF + \int_{v_2 \leq c_2} \theta(v_2 - c_2) dF - \overline{u},$

$U_S^{LT} = \overline{u}.$

We should emphasize that we have considered only a very particular kind of long-term contract. More general long-term contracts would allow one or both parties to breach by paying damages. We will return to this issue later, but simply note at this point that our results do not change significantly if more general contracts are allowed.

Short-term contract

We consider next the case where B and S sign a contract that specifies trade only for period 1 *with no commitment, promise, or understanding that trade will occur in period 2*. However, trade in period 2 is not ruled out.

Obviously, if $v_2 \leq c_2$, no trade will occur in period 2. If $v_2 > c_2$, the parties will renegotiate from scratch since no promises have been made: the reference point is no trade. The implication of this is that B offers S a payoff equal to zero, but S feels entitled to 100% of the gains from trade, $v_2 - c_2$. Thus S's aggrievement is $A = v_2 - c_2$, shading $= \theta(v_2 - c_2)$, and B's net payoff $= (1 - \theta)(v_2 - c_2)$ while S's payoff is zero.

Let p_1 be the first period price. An optimal short-term contract solves:

(2.4) $Max\ (v_1 - p_1) + \int_{v_2 > c_2} (1 - \theta)(v_2 - c_2) dF$

S.T.

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affect S's payoff, something we do not allow for here. Obviously, there are other reasons why renegotiation may lead to deadweight losses. We appeal to aggrievement and shading because we will use these ideas in what follows.

(2.5) $(p_1 - c_1) \geq \overline{u}$.

Again (2.5) holds with equality since B can always gain from reducing p_1. Hence

(2.6) $U_B^{ST} = (v_1 - c_1) + \int_{v_2 > c_2} (1-\theta)(v_2 - c_2) dF - \overline{u}$,

$U_S^{ST} = \overline{u}$.

Continuing contract

We now turn to what we call a continuing contract. A continuing contract is a contract that specifies trade in the first period, does not commit the parties to trade in the second period, but includes some sort of understanding to the effect that they will "bargain in good faith" to reach an agreement in the second period.

We formalize the idea of good faith as follows. At date 1, if $v_2 \leq c_2$, the parties walk away. However, if $v_2 > c_2$, they bargain using the period 1 contract as a reference point. If conditions have not changed much, that is, $v_2 \approx v_1, c_2 \approx c_1$, then good faith means that the price should not change much. (There is an exception to this, noted below, if $p_1 < c_1$ or $p_1 > v_1$.) On the other hand, if v_2 or c_2 do change relative to v_1, c_1, then good faith means that the price can change but only commensurate with the changes in v and c.

To be precise, suppose $v_2 > c_2$, and let $\Delta G = (v_2 - c_2) - (v_1 - c_1)$. We distinguish between the cases $\Delta G \geq 0$ and $\Delta G < 0$. Previously we assumed that each party feels entitled to 100% of any change in surplus. However, that was for the case where the change was always positive. We now assume that B and S's self-serving biases are such that each party feels entitled to any *increase* in surplus but feels that the other should suffer any *decrease* in surplus. However, both regard the initial contract as a reference point.

It follows that B regards $\underline{p}$ as a reasonable price where

(2.7) $\underline{p} - c_2 = p_1 - c_1 + Min(\Delta G, 0)$.

That is, B believes that S's period 2 payoff should equal her period 1 payoff if $\Delta G \geq 0$ and fall by $-\Delta G$ if $\Delta G < 0$. However, B recognizes that he cannot offer a price below c_2 ($\underline{p} < c_2$ if $p_1 < c_1$ and $\Delta G > 0$) and, of course, B would never offer a price in excess of v_2 ($\underline{p} > v_2$ if $p_1 > v_1$ and $\Delta G < 0$). Thus B will adjust $\underline{p}$ so that it lies in the $[c_2, v_2]$ range and offer S

(2.8) $\hat{p} = Min\left(v_2, Max\left(\underline{p}, c_2\right)\right)$.

By a parallel argument, S regards $\overline{p}$ as a reasonable price where

(2.9) $\overline{p} - c_2 = p_1 - c_1 + Max(\Delta G, 0)$.

That is, S thinks that her payoff should rise by ΔG if $\Delta G \geq 0$ and stay the same if $\Delta G < 0$. However, S recognizes that price must lie between c_2 and v_2 and so feels entitled to

(2.10) $\tilde{p} = Min\big(v_2, Max(\overline{p}, c_2)\big)$.

It follows that S's aggrievement is given by $A = \tilde{p} - \hat{p}$ and she shades by θA. Hence B's and S's period 2 payoffs are given by

(2.11) $U_B^2 = v_2 - \hat{p} - \theta(\tilde{p} - \hat{p})$,

(2.12) $U_S^2 = \hat{p} - c_2$,

respectively.

Given the above, an optimal continuing contract solves:

(2.13) $Max\ (v_1 - p_1) + \int_{v_2 > c_2} \big(v_2 - \hat{p} - \theta(\tilde{p} - \hat{p})\big) dF$

S.T.

(2.14) $(p_1 - c_1) + \int_{v_2 > c_2} (\hat{p} - c_2) dF \geq \overline{u}$.

It is easy to see that (2.14) holds with equality: if not, reducing p_1 a little reduces $\hat{p}$ and $\tilde{p}$ and hence raises $v_2 - (1-\theta)\hat{p} - \theta\tilde{p}$, which increases (2.13)[16]. Substituting (2.14) into (2.13) we can write the parties' payoffs as

(2.15) $U_B^C = (v_1 - c_1) + \int_{v_2 > c_2} [v_2 - c_2 - \theta(\tilde{p} - \hat{p})] dF - \overline{u}$,

$U_S^C = \overline{u}$.

Note that p_1 affects $(\tilde{p} - \hat{p})$ and so is still present in (2.15). Thus in contrast to a short-term or long-term contract it is not the case that U_B^C changes one to one with $\overline{u}$.

Remark: It is easy to see that $p_1 \geq c_1$ in both an optimal short-term and an optimal continuing contract given that $\overline{u} \geq Er_S \geq 0$ (note that, if $p_1 < c_1$, $\hat{p} \leq c_2$).

At this point an example may help. Suppose that $v_1 = 20$, $c_1 = 10$ and $p_1 = 15$. Assume that at date 1 it is learned that $v_2 = 24$, $c_2 = 12$ (surplus goes up by 2). Then with a continuing contract B will regard 17 as the appropriate price (this gives all the additional surplus to B), while S will regard 19 as the

[16] Note that p_1 plays two roles. It acts as a reference point for the period 2 price and it also serves to distribute surplus. We are ruling out the possibility that a lump sum transfer can used to distribute surplus independently of the first period price. Our assumption is that, if this were attempted, the parties would "see through it" and use the average of the two as a reference point.

appropriate price (this gives all the additional surplus to S). B will offer 17 but S will be aggrieved by 2 and will shade by 2θ.

Suppose instead that it is learned that $v_2 = 24,\ c_2 = 20$ (surplus goes down by 6). Now B regards 19 as the right price since this makes S bear the full decrease in surplus. However, S will not trade at 19 and so B adjusts his notion of entitlement so that 20 becomes a reasonable price. S regards 25 as a reasonable price by a similar argument, but since B will not trade at this price she adjusts her entitlement to 24. Thus B will offer 20 but S will be aggrieved by 4 and will shade by 4θ.

We now turn to a comparison of long-term, short-term, and continuing contracts. In the case of no outside options it is easy to show that a continuing contract is always at least as good for B as a short-term contract (S is indifferent since she always gets $\overline{u}$).

Proposition 1. With no outside options, $U_B^C \geq U_B^{ST}$.

Proof: Consider an optimal continuing contract. We know from (2.15) that

(2.16) $U_B^C = (v_1 - c_1) + \int_{v_2 > c_2} [v_2 - c_2 - \theta(\tilde{p} - \hat{p})] dF - \overline{u}$

$\geq (v_1 - c_1) + \int_{v_2 > c_2} (1 - \theta)(v_2 - c_2) dF - \overline{u} = U_B^{ST}$,

where the inequality follows from the fact that $\tilde{p} - \hat{p} \leq v_2 - c_2$. Q.E.D.

In other words, in this very simple setting, good faith is always a plus: it reduces aggrievement and shading since, with the first period contract as a reference point, there is less to argue about in period 2. (In the above example there was strictly less to argue about in the first case when surplus went up and the same amount to argue about in the second case when surplus went down.)

In order to compare a continuing contract with a long-term contract, it is useful to proceed as follows. Write the distribution function of (v_2, c_2) conditional on $v_2 > c_2$ as F_1 and the distribution function of (v_2, c_2) conditional on $v_2 \leq c_2$ as F_2. That is,

(2.17) $$F = \pi F_1 + (1 - \pi) F_2,$$

where $\pi = prob(v_2 > c_2)$. In Proposition 2(i) we keep F_1 and F_2 fixed and vary π. In Proposition 2(ii) we keep π and F_2 fixed and vary F_1.

Proposition 2

(i) Fix F_1 and F_2. For π close to 0 a continuing contract is superior to a long-term contract, whereas for π close to 1 a long-term contract is superior to a continuing contract.

(ii) Fix $0 < \pi < 1$ and F_2. Suppose $Prob(|v_2 - c_2 - (v_1 - c_1)| \leq \varepsilon | v_2 > c_2) = 1$ for some $\varepsilon > 0$. Then if ε is small enough a continuing contract is superior to a long-term contract.

Proof

Result (i) is obvious. If π equals zero a long-term contract is always renegotiated and hence exhibits shading, while a continuing contract yields the efficient outcome – no trade – with no shading. By continuity the ranking of the contracts stays the same for π close to zero. The opposite argument applies for $\pi = 1$.

To prove (ii), note that a continuing contract achieves the first-best if $\varepsilon = 0$. The reason is that either $v_2 < c_2$ and the parties walk away or $v_2 > c_2$ and there is nothing to argue about in period 2: B and S agree that the price should stay the same (or if $p_1 > v_1$ that it should equal v_2). Also p_1 can be adjusted so that S receives $\overline{u}$ and B obtains all the surplus.

In contrast a long-term contract does not achieve the first-best since renegotiation and shading occur if $v_2 < c_2$.

Again by continuity the ranking of the contracts is preserved for ε close to zero. Q.E.D.

3. Outside options

In this section we allow for the possibility that $r_B, r_S \neq 0$. This does not change the analysis of long-term and short-term contracts significantly. It also does not change the analysis of continuing contracts to the extent that appealing to outside options in the bargaining process is consistent with good faith, e.g., because they correspond to market trends — see the discussion in the introduction. (We refer to this as case M.) However, good faith may prevent parties from incorporating outside options into the bargaining process if the outside options are idiosyncratic and do not represent market trends: doing so may be seen as opportunistic. (We refer to this as case I.) In this case the analysis does change[17].

Let us deal first with the easy cases of long-term and short-term contracts. With a long-term contract renegotiation will occur if $v_2 - c_2 < r_B + r_S$. In this case B will offer S $p - c_2 - r_S$ not to trade, but S will feel entitled to $r_B - v_2 + p$. Shading = $\theta(r_B + r_S - v_2 + c_2)$. Thus, analogously to (2.1) – (2.2), a long-term contract solves:

(3.1) $$Max\ (v_1 - p) + \int_{v_2 - c_2 > r_B + r_S} (v_2 - p)dF + \int_{v_2 - c_2 \leq r_B + r_S} [c_2 + r_B + r_S - p - \theta(c_2 + r_B - v_2 + r_S)]dF$$

S.T.

(3.2) $$(p - c_1) + \int (p - c_2)dF \geq \overline{u}.$$

As before, (3.2) holds with equality and

[17] Of course, any real situation will include elements of both cases: with some probability the outside options will represent market trends and can be included in bargaining and with some probability they will not represent market trends and cannot be included. To simplify we consider the two cases separately.

(3.3)

$$U_B^{LT} = (v_1 - c_1) + \int\limits_{v_2 - c_2 > r_B + r_S} (v_2 - c_2)dF + \int\limits_{v_2 - c_2 \le r_B + r_S} [r_B + r_S + \theta(v_2 - c_2 - r_B - r_S)]dF - \overline{u},$$

$$U_S^{LT} = \overline{u}.$$

By analogy to (2.4) - (2.5), a short-term contract will solve:

(3.4) $Max\ (v_1 - p_1) + \int r_B dF + \int_{v_2 - c_2 > r_B + r_S} (1 - \theta)(v_2 - c_2 - r_B - r_S)dF$

S.T.

(3.5) $(p_1 - c_1) + \int r_S dF \ge \overline{u}.$

(3.5) holds with equality and so

(3.6) $U_B^{ST} = (v_1 - c_1) + \int (r_B + r_S)dF + \int_{v_2 - c_2 > r_B + r_S} (1 - \theta)(v_2 - c_2 - r_B - r_S)dF - \overline{u},$

$U_S^{ST} = \overline{u}.$

Consider next a continuing contract. Start with case M where outside options can be used in the bargaining. Suppose $v_2 - c_2 > r_B + r_S$. Then the analysis is very similar to that of Section 2. B thinks that $\underline{p}$ is a reasonable price but recognizes that price must lie in the $[c_2 + r_S, v_2 - r_B]$ range and so offers S

(3.7) $\hat{p}^M = Min\left(v_2 - r_B, Max\left(\underline{p}, c_2 + r_S\right)\right).$

S thinks that $\overline{p}$ is a reasonable price but recognizes that price must lie in the $[c_2 + r_S, v_2 - r_B]$ range and so adjusts her entitlement to

(3.8) $\tilde{p}^M = Min\big(v_2 - r_B, Max(\overline{p}, c_2 + r_S)\big)$.

In other words in case M each party is willing to adjust the price to match the other party's outside option if there are gains from trade. An optimal continuing contract solves:

(3.9) $Max\ (v_1 - p_1) + \int_{v_2 - c_2 > r_B + r_S} \big(v_2 - \hat{p}^M - \theta(\tilde{p}^M - \hat{p}^M)\big)dF + \int_{v_2 - c_2 \le r_B + r_S} r_B dF$

S.T.

(3.10) $(p_1 - c_1) + \int_{v_2 - c_2 > r_B + r_S} (\hat{p}^M - c_2)dF + \int_{v_2 - c_2 \le r_B + r_S} r_S dF \ \ge \overline{u}.$

As before, (3.10) holds with equality and so we obtain

(3.11) $U_B^{CM} = (v_1 - c_1) + \int_{v_2 - c_2 \leq r_B + r_S} (r_B + r_S) dF + \int_{v_2 - c_2 > r_B + r_S} \left(v_2 - c_2 - \theta(\tilde{p}^M - \hat{p}^M)\right) dF - \overline{u},$

$U_S^{CM} = \overline{u}.$

Proposition 1 generalizes to this case.

We turn now to the case where outside options *cannot* be used in bargaining (case I). It is helpful to start with an example. Suppose $v_1 = 20$, $c_1 = 10$ and $p_1 = 15$. At date 1 it is learned that $v_2 = 24$, $c_2 = 12, r_B = 0$, $r_S = 6$. In Section 2 we considered this case without outside options and argued that B would offer S 17. B would reason that surplus has risen relative to period 1 and he is entitled to the increase, thus S's payoff should remain at 5. Of course, given that S now has an outside option of 6 trade will fail to occur at a price of 17. Can B be more flexible? We argue that he can. In particular, B can accept that some or all of the surplus increase belongs to S if this is necessary to ensure trade. As a result B is willing to offer S up to 19. However, B is not willing to go further: he is not willing to accept a payoff reduction given that surplus has risen. (This is the difference between cases M and I.)

Of course, with B's increased flexibility, trade can occur when $r_S = 6$ since B will offer S 18. But, since B is not willing to go above 19, if $7 < r_S < 12$ trade will not occur even though this is inefficient. Thus in case I good faith sometimes leads to inefficient outcomes.

Let us now move to the general analysis. As we have seen B feels that $\hat{p} = Min\left(v_2, Max\left(\underline{p}, c_2\right)\right)$ is a reasonable price. However, B is willing to ascribe all increases in surplus and no decreases in surplus to S if this is necessary to ensure trade, which yields $\tilde{p} = Min\left(v_2, Max(\overline{p}, c_2)\right)$ as a reasonable price. (Of course, this is the price S thinks is reasonable although analogously to B she is flexible enough to accept $\hat{p}$ if this is necessary to ensure trade.) Thus the range of acceptable prices is $[\hat{p}, \tilde{p}]$. If this range intersects with the range $[c_2 + r_S, v_2 - r_B]$, trade is possible; otherwise it is not. (If $v_2 - r_B < c_2 + r_S$ the intersection is of course empty.) In our example $[\hat{p}, \tilde{p}] = [17,19]$, $[c_2 + r_S, v_2 - r_B] = [12 + r_S, 24]$ and so the intersection is nonempty as long as $r_S \leq 7$.

If $[c_2 + r_S, v_2 - r_B] \cap [\hat{p}, \tilde{p}] \neq \emptyset$, let p' be the smallest price in the intersection and p'' the largest price. B will offer p', S will be aggrieved by $(p'' - p')$ and shading $= \theta(p'' - p')$.

Thus a continuing contract solves:

(3.12)

$$Max\ (v_1 - p_1) + \int_{[c_2 + r_S, v_2 - r_B] \cap [\hat{p}, \tilde{p}] \neq \emptyset} \left(v_2 - p' - \theta(p'' - p')\right) dF + \int_{[c_2 + r_S, v_2 - r_B] \cap [\hat{p}, \tilde{p}] = \emptyset,} r_B dF$$

S.T.

(3.13) $(p_1 - c_1) + \int_{[c_2 + r_S, v_2 - r_B] \cap [\hat{p}, \tilde{p}] \neq \emptyset} (p' - c_2) dF + \int_{[c_2 + r_S, v_2 - r_B] \cap [\hat{p}, \tilde{p}] = \emptyset} r_S dF \geq \overline{u}.$

Remark: It is again easy to see that $p_1 \geq c_1$ in both an optimal short-term and an optimal continuing contract (case M or I), given that $\overline{u} \geq Er_S \geq 0$.

An important difference from the M case is that (3.13) may not be binding at the optimum. The reason is that (3.12) may not be monotonic in p_1 given that a lower p_1 may lead to inefficient outcomes. Also it is no longer true that a continuing contract is always superior to a short-term contract. Example 3.1 illustrates both of these possibilities.

Example 3.1

There is no uncertainty, $v_1 = 20, c_1 = 10, v_2 = 20, c_2 = 10,\ r_S = 1, \overline{u} = 1.$

Consider a continuing contract (case I). Suppose $10 \leq p_1 \leq 20$. Since $v_2 = v_1,\ c_2 = c_1,\ \overline{p} = \underline{p} = p_1$ and so $\hat{p} = \tilde{p} = p_1$. That is, $p_2 = p_1$: no change in price is possible. Hence, given S's outside option in period 2, trade will occur in period 2 only if $p_2 = p_1 \geq 11$. Given $p_1 \geq 11$, it is optimal for B to set $p_1 = 11$: this ensures trade in both periods and yields $U_B = 18, U_S = 2$. Alternatively, if $p_1 < 11$, since no trade occurs in period 2, it is best for B to set $p_1 = 10$. This yields $U_B = 10, U_S = 1$. (It is easy to show that $p_1 < 10$ or $p_1 > 20$ is not optimal.)

Obviously the first contract is superior, and this gives S more than her reservation utility $\overline{u}$. As promised (3.8) is not binding.

Now let's compare the optimal continuing contract with a short-term contract. Under a short-term contract

$$U_S^{ST} = p_1 - c_1 + r_S = \overline{u}$$

and so $p_1 = 10$. Hence

$$U_B^{ST} = 10 + (1-\theta)9 = 19 - 9\theta$$
$$> 18 = U_B^{CN}$$

if $\theta < \frac{1}{9}$.

In other words, if $\theta < \frac{1}{9}$, a short-term contract is superior to a continuing contract: the reason is that the shading cost is less than the benefit of keeping S at her reservation utility.

Of course, in this example, with no uncertainty, a long-term contract achieves the first-best since trade is always efficient. The next example shows that a short-term contract can be uniquely optimal.

Example 3.2

$v_1 = 20, c_1 = 10, v_2 = 20, c_2 = 10$. Outside options in period 2, r_B, r_S are i.i.d. random variable: each outside option = 6 with probability ρ and 0 with probability $(1-\rho)$. $\overline{u} = 12 - 6\rho + 6\rho^2$.

There are four states of the world:

	S1 (prob $\rho(1-\rho)$)	**S2** (prob $\rho(1-\rho)$)	**S3** (prob ρ^2)	**S4** (prob $(1-\rho)^2$)
r_B	6	0	6	0
r_S	0	6	6	0

Figure 2

Using (3.3) and (3.6) we can compute

(3.14) $U_B^{LT} = 10 + 10(1-\rho^2) + [10 + 2(1-\theta)]\rho^2 - \overline{u}$,

(3.15) $U_B^{ST} = 10 + 2\rho(1-\rho)[6 + 4(1-\theta)] + (1-\rho)^2 10(1-\theta) + 12\rho^2 - \overline{u}$.

Now consider a continuing contract (case I). Since $v_2 = v_1, c_2 = c_1$, the price cannot change: $p_2 = p_1$ (as in Example 3.1). If $p_1 \leq 14$ trade occurs only in s1 and s4. If $p_1 \geq 16$, trade occurs only in s2 and s4. If $14 < p_1 < 16$, trade occurs only in s4. In all these cases trade should occur in all of s1, s2, s4 but does not.

It is easy to see that it is best for B to offer $p_1 = 16$. This yields

(3.16) $U_B^{CN} = 4 + 6\rho(1-\rho) + 4\rho(1-\rho) + 6\rho^2 + 4(1-\rho)^2 = 8 + 2\rho$,

(3.17) $U_S^{CN} = 12 - 6\rho + 6\rho^2 = \overline{u}$.

It is clear that if θ is small, $U_B^{CN} < Min\left(U_B^{ST}, U_B^{LT}\right)$ since the short-term and long-term contracts approximate the first-best while in the optimal continuing contract trade fails to take place in s1, and this is inefficient. But it is also easy to show that $U_B^{ST} > U_B^{LT}$ if $\rho > \frac{5}{6}$. Hence for small θ and $\rho > \frac{5}{6}$, a short-term contract is uniquely optimal.

The next proposition provides some general conditions under which the contracts can be ranked. It parallels Proposition 2 and as there it is useful to write

(3.18) $F = \pi F_1 + (1-\pi)F_2$,

where F_1 is the distribution of (v_2, c_2, r_B, r_S) conditional on $v_2 - c_2 > r_B + r_S$, F_2 is the distribution of (v_2, c_2, r_B, r_S) conditional on $v_2 - c_2 \leq r_B + r_S$, and $\pi = Prob(v_2 - c_2 > r_B + r_S)$.

Proposition 3 (for case I)

(i) Fix F_1 and F_2. For π close to zero, a short-term or continuing contract is superior to a long-term contract, whereas for π close to 1 the reverse is the case.

(ii) Fix $0 < \pi < 1$. Suppose $Prob(|v_2 - c_2 - (v_1 - c_1)| \leq \varepsilon, r_B \leq \eta, r_S \leq \eta | v_2 - c_2 > r_B + r_S) = 1$ for some $\varepsilon > 0, \eta > 0$. Then for ε, η small enough a continuing contract is optimal.

(iii) Suppose there exist r_1, r_2 such that $(v_1, c_1, r_1, r_S) \in$ support F_1 for some r_S and $(v_1, c_1, r_B, r_2) \in$ support F_1 for some r_B, where $r_1 + r_2 > v_1 - c_1$. Then for θ small enough a long-term or short-term contract is superior to a continuing contract.

Proof

Part (i) is proved in the same way as in Proposition 2. To prove (ii), note that a continuing contract achieves the first-best if $\varepsilon = \eta = 0$. The reason is that either $v_2 - c_2 \leq r_B + r_S$ and the parties walk away or $v_2 - c_2 > r_B + r_S$ and there is nothing to argue about in period 2: B and S agree that the price should stay the same (or if $p_1 > v_1$ that it should equal v_2) and since $r_B = r_S = 0$ trade occurs. Also p_1 can be adjusted so that S receives $\overline{u}$ and B obtains all the surplus. By continuity the same is true if $\varepsilon, \eta > 0$ are small.

To prove (iii), note that if θ is small a long-term or short-term contract approximates the first-best. In contrast a continuing contract does not since good faith bargaining leads to a second period price that depends only on v_2, c_2 and not on outside options, and hence trade cannot occur in both (v_1, c_1, r_1, r_S) and (v_1, c_1, r_B, r_2): there will be inefficiency in a continuing contract. Q.E.D.

4. Renewable and Exclusive Contracts

We have studied a particular class of contracts. But there are other possibilities. We consider two in this section: renewable and exclusive contracts[18].

4.1 Renewable Contracts

A renewable contract is a contract that specifies a first period price and a second period price, but allows either party to walk away in the second period. Another way to think of a renewable contract is that, concerning the second period, it is an "agreement to agree". As mentioned in the introduction such contracts are observed in practice.

A renewable contract can then be represented by a first period price p_1 and a second period price p_2.[19] Trade occurs in the second period if

[18] We could consider other types of contracts, e.g., long-term contracts that that allow one of both parties to exit (or "breach") but only if they pay damages; or contracts that give one or both parties an option to exercise trade in the second period. Doing so would not vitiate the relevance of the trade-offs discussed here.

(4.1) $v_2 - p_2 \geq r_{B,}$

(4.2) $p_2 - c_2 \geq r_S$.

If one of (4.1) - (4.2) fails to hold, but $v_2 - c_2 > r_B + r_S$ the parties renegotiate. In this case B offers S a price $p = c_2 + r_S$, S feels entitled to $v_2 - r_B$, and S shades by $\theta(v_2 - c_2 - r_B - r_S)$. An optimal renewable contract solves:

(4.3) $Max\ v_1 - p_1 + \int_{v_2 - p_2 \geq r_B, p_2 - c_2 \geq r_S} (v_2 - p_2)\, dF$

$$+ \int_{v_2 - c_2 > r_B + r_S, v_2 - p_2 < r_B \text{ or } p_2 - c_2 < r_S} [v_2 - c_2 - r_S - \theta(v_2 - c_2 - r_B - r_S)]dF + \int_{v_2 - c_2 < r_B + r_S} r_B dF$$

S.T.

(4.4) $p_1 - c_1 + \int_{v_2 - p_2 \geq r_B, p_2 - c_2 \geq r_S} (p_2 - c_2)dF + \int_{v_2 - c_2 > r_B + r_S, v_2 - p_2 < r_B \text{ or } p_2 - c_2 < r_S} r_S dF + \int_{v_2 - c_2 \leq r_B + r_S} r_S dF \geq \overline{u}$

Since (4.3) is decreasing in p_1, (4.4) will be binding at the optimum. Thus we can write

(4.5) $U_B^R = Max_{p_2} \Big[v_1 - c_1 + \int (r_B + r_S)dF + \int_{v_2 - p_2 \geq r_B, p_2 - c_2 \geq r_S} (v_2 - c_2 - r_B - r_S)\, dF + \int_{v_2 - c_2 > r_B + r_S, v_2 - p_2 < r_B \text{ or } p_2 - c_2 < r_S} [(1 - \theta)(v_2 - c_2 - r_B - r_S)]dF - \overline{u} \Big]$

$$U_S^R = \overline{u}$$

Compared with a continuing contract, a renewable contract has advantages and disadvantages. The advantage is that the second period price is nailed down and so, if (4.1) - (4.2) are satisfied, trade will occur and there is nothing to argue about. In contrast, under a continuing contract, there will be argument and aggrievement if $v_2 - c_2 \neq v_1 - c_1$ and, in case I, trade may not occur at all. The disadvantage of a renewable contract is that, if (4.1) or (4.2) is not satisfied, the parties will bargain over the whole gains from trade $(v_2 - c_2 - r_B - r_S)$ in renegotiation and there will be substantial shading. In contrast under a continuing contract the use of the first period contract as a reference point may allow the parties to adjust to the new situation relatively easily.

[19] We could consider a price range, with B choosing from this range ex post, instead of a single second period price (as in Hart and Moore (2008)). This would not change the analysis significantly.

Since our focus in this paper has been on continuing contracts we present two examples showing that a continuing contract can be superior to a renewable contract. We do not mean to suggest, however, that the ranking cannot be reversed[20].

Example 4.1

$v_1 = 20, c_1 = 10, (v_2, c_2) = (20,10), (35,25)$ or $(10,20), r_B = r_S = 0, \overline{u} = 0.$

The first-best can be achieved with a continuing contract where $p_1 = 10$. In period 2 the surplus is the same as in period 1 if it is positive. Therefore the parties agree that S's payoff should be zero as in period 1. This yields $p_2 = 10$ if $(v_2, c_2) = (20,10)$ and $p_2 = 25$ if $(v_2, c_2) = (35,25)$. There is no shading.

In contrast, a renewable contract does not achieve the first-best since there is no $p_2 \in [10,20] \cap [25,35]$.

Example 4.2

$v_1 = 20, c_1 = 10, (v_2, c_2) = (20,10)$ or $(10,20)$, $(r_B, r_S) = (7,0), (0,7)$ or $(4,4)$. (v_2, c_2) and (r_B, r_S) are independent. $\overline{u} = Er_S$.

Assume that outside options *can* be used in bargaining (case M). Then a continuing contract with $p_1 = 10$ achieves the first-best. Suppose $(v_2, c_2) = (20,10)$. Then since $(v_2, c_2) = (v_1, c_1)$, both parties think that $p_2 = 10$ is a reasonable price. However, both recognize that outside options must be matched to ensure trade. This yields $p_2 = 10$ if $(r_B, r_S) = (7,0)$, $p_2 = 17$ if $(r_B, r_S) = (0,7)$, and $p_2 = 14$ if $(r_B, r_S) = (4,4)$. There is no aggrievement or shading.

In contrast, a renewable contract does not achieve the first-best. The reason is that there is no p_2 such that (4.1) - (4.2) are satisfied for $(v_2, c_2, r_B, r_S) = (20,10,7,0)$, $(v_2, c_2, r_B, r_S) = (20,10,0,7)$ since that would require

(4.6) $20 - p_2 \geq 7,$

(4.7) $p_2 - 10 \geq 7,$

which is impossible.

[20] In our formulation a renewable contract is always at least as good as a short-term contract. This is because the parties can always renegotiate if (4.1) or (4.2) fails to hold, as if the renewable contract never existed. This may be too optimistic. In some cases renegotiation of a renewable contract may be seen as opportunistic and the parties may simply walk away. A short-term contract can then be better than a renewable contract.

4. 2 Exclusive Contracts

A feature of a continuing contract is that the parties are free to walk away. We now consider the possibility that the parties constrain themselves not to do that. In particular, B and S agree that, while they will not necessarily trade with each other, they will not trade with anyone else: neither can quit because of an outside option. (Of course, such a contract can always be renegotiated.) In addition the contract is continuing in the sense that, if the parties bargain with each other, this bargaining will be in good faith. We call a contract of this type an "exclusive contract". We will see that an exclusive contract may have some advantages over a continuing contract (case I).

Suppose first that B and S learn at date 1 that $v_2 - c_2 \geq r_B + r_S$. Then the exclusive contract will not be renegotiated since trade is efficient. The outside options are irrelevant since neither party can walk away. Hence the analysis is as in Section 2. B will offer S

(4.8) $\hat{p} = Min\left(v_2, Max\left(\underline{p}, c_2\right)\right)$,

and S will shade by $\theta(\hat{p} - \tilde{p})$, where

(4.9) $\tilde{p} = Min\left(v_2, Max(\overline{p}, c_2)\right)$.

The parties' period 2 payoffs are

(4.10) $U_B^2 = v_2 - \hat{p} - \theta(\tilde{p} - \hat{p})$,

(4.11) $U_S^2 = \hat{p} - c_2$.

Suppose next that $v_2 - c_2 < r_B + r_S$. Then renegotiation will occur. There are two subcases. If $v_2 \leq c_2$, in the absence of renegotiation the parties would not trade and so each would get a payoff of zero. In this subcase B will offer S $-(r_S)$, S will feel entitled to r_B, and S will shade by $\theta(r_B + r_S)$. The period 2 payoffs are

(4.12) $U_B^2 = r_B + r_S - \theta(r_B + r_S)$,

(4.13) $U_S^2 = 0$.

The second subcase is where $v_2 > c_2$. Then in the absence of renegotiation B and S would bargain in good faith and agree to trade. The analysis of good faith bargaining is the same as in Section 2. B will offer $\hat{p}$, and S will feel entitled to $\tilde{p}$. S's payoff $= \hat{p} - c_2$. Consider now the renegotiation to allow the parties to trade elsewhere. B will offer S $-r_B + \hat{p} - c_2$, and S will feel entitled to r_B- $v_2 + \tilde{p}$. S's total shading $= \theta(r_B + r_S - v_2 + c_2 + \tilde{p} - \hat{p})$. Thus period 2 payoffs will be given by

(4.14) $U_B^2 = r_B + r_S - \hat{p} + c_2 - \theta(r_B + r_S - v_2 + c_2 + \tilde{p} - \hat{p})$,

(4.15) $U_S^2 = \hat{p} - c_2$.

It follows that an optimal exclusive contract solves:

(4.16) $Max\ (v_1 - p_1) + \int_{v_2 - c_2 > r_B + r_S} \big(v_2 - \hat{p} - \theta(\tilde{p} - \hat{p})\big) dF + \int_{v_2 - c_2 \le r_B + r_S, v_2 \le c_2,} [r_B + r_S - \theta(r_B + r_S)] dF + \int_{v_2 - c_2 \le r_B + r_S, v_2 > c_2,} [r_B + r_S - \hat{p} + c_2 - \theta(r_B + r_S - v_2 + c_2 + \tilde{p} - \hat{p})] dF$

S.T.

(4.17) $(p_1 - c_1) + \int_{v_2 - c_2 \ge r_B + r_S} (\hat{p} - c_2) dF + \int_{v_2 - c_2 < r_B + r_S, v_2 > c_2} (\hat{p} - c_2) dF \ge \overline{u}.$

Under an exclusive contract the inefficiency that arose with a continuing contract (case I) does not occur. In particular, trade takes place whenever $v_2 - c_2 > r_B + r_S$, since neither party can quit without renegotiation.

It is easily seen that B's payoff in (4.16) is decreasing in p_1: a reduction in p_1 reduces $(1 - \theta)\hat{p} + \tilde{p}$. Hence (4.17) will be binding at an optimum. (Recall that this is also true for long-term and short-term contracts but was not true for continuing contracts in the presence of outside options.) We can therefore write B's payoff as

(4.18) $U_B^E = v_1 - c_1 + \int_{v_2 - c_2 \ge r_B + r_S} \big(v_2 - \hat{p} - \theta(\tilde{p} - \hat{p})\big) dF$

$$+ \int_{v_2 - c_2 < r_B + r_S, v_2 \le c_2,} [r_B + r_S - \theta(r_B + r_S)] dF +$$

$$\int_{v_2 - c_2 < r_B + r_S, v_2 > c_2,} [r_B + r_S - \theta(r_B + r_S - v_2 + c_2 + \tilde{p} - \hat{p})] dF,$$

while

(4.19) $U_S^E = \overline{u}.$

As we have noted exclusive contracts can be more efficient than continuing contracts (case I) since trade will always occur when $v_2 - c_2 > r_B + r_S$. At the same time, similar to long-term contracts, exclusive contracts involve renegotiation costs if $v_2 - c_2 < r_B + r_S$. There is no simple ranking between long-term, short-term, continuing (case I), and exclusive contracts, but the following proposition identifies a situation where an exclusive contract is optimal[21].

Proposition 4

Suppose that for some $\varepsilon > 0$, (A) $v_2 - c_2 \ge r_B + r_S \Rightarrow |\, v_2 - c_2 - (\, v_1 - c_1)| \le \varepsilon$, (B) $v_2 - c_2 < r_B + r_S \Rightarrow v_2 < c_2$ and $r_B < \varepsilon,\ r_S < \varepsilon$. Then, if ε is small, an exclusive contract approximates the first-best.

[21] It is easy to show that a continuing contract (case M) always dominates an exclusive contract.

Proof

(A) guarantees that, whenever trade is efficient, there is little to argue about given that the period 1 contract is a reference point. (B) guarantees that, whenever trade is inefficient, there is also little to argue about given that $r_B + r_S$ is small. Q.E.D.

Two points should be noted. First, if there is a significant probability that $v_2 - c_2 < r_B + r_S$ and that $v_2 - c_2 > r_B + r_S$, then neither a long-term contract nor a short-term contract will approximate the first-best since both will involve renegotiation costs. Also a continuing contract (case I) will not approximate the first-best if r_B or r_S can be high when $v_2 - c_2 \geq r_B + r_S$, since it will be impossible to find a p_1 such that neither party ever quits. Hence under the conditions of Proposition 4 an exclusive contract will typically be optimal among the contracts we have considered.

Note also that condition (B) is less restrictive than it may appear. It says that when trade is inefficient between B and S neither party can do well elsewhere. But this may be the case if a high cost c_2 for S also means that S's cost of supplying elsewhere is high; and if a low value v_2 for B also means that B's value from buying elsewhere is low.

5. Conclusions

In this paper we have studied the trade-off between long-term, short-term, and continuing contracts in a setting where gains from trade are known to be present in the short-term, and may or may not be present in the long-term. Long-run contracts are disadvantageous to the extent that renegotiation is required if gains from trade end prematurely. Short-term contracts are disadvantageous to the extent that a new contract must be renegotiated if gains from trade persist. A continuing contract, which we define to be one that uses the initial contract as a reference point, can be a useful compromise. If the gains from trade disappear the parties can walk away. On the other hand, if they persist, the use of the first contract as a reference point can reduce the cost of negotiating the next contract. Continuing contracts are not a panacea, however, since good faith bargaining may preclude the use of outside options in the bargaining process and as a result parties will sometimes fail to trade when this is efficient.

We have also shown that a continuing contract that leaves the terms of trade in subsequent periods open can be superior to a renewable contract that specifies these terms.

Clearly our paper is only a start on the analysis of these different types of contract, and there are several further developments that seem fruitful. First, our model is based on the idea that the market at date 0 is more competitive than at date 1: indeed at date 0 it is perfectly competitive, whereas at date 1 parties' outside options are exogenous and may yield each party strictly less than if they trade together. In other words there is a "fundamental transformation" in the sense of Williamson (1985). However, we

have not modeled this transformation explicitly. It would be interesting to do this, perhaps by introducing relationship-specific investments.

Related to this, if there are many buyers and sellers at date 0, then the contracts they sign with each other will affect who is available as a trading partner at date 1. Under these conditions outside options at date 1 will no longer be exogenous, but will be determined as part of a general equilibrium. Analyzing this general equilibrium would seem valuable although challenging.

In our analysis of continuing contracts we have distinguished between the cases where outside options can or cannot be used in the bargaining process. We argued that which case applies may depend on norms and practices in the industry or country concerned. However, it may also depend on agents' actions. For example, if a worker receives an outside offer out of the blue, his or her employer may treat this differently from the case where the worker searched for this offer: the employer may be more willing to match in the first case than the second. Another way to enrich the model would be to recognize that many outside opportunities are not obtained costlessly but are the result of a search process.

Our analysis has several other obvious limitations. First, we have assumed that nothing is verifiable. But in practice there may be signals of profitability that the parties can use as an index for prices. The relevant question may then become whether it is better for the parties to choose a renewable indexed contract or a continuing contract that leaves the terms open. The framework we have developed here should be useful for analyzing this.[22] Second, we have ignored risk-aversion, wealth constraints, and moral hazard (e.g., the seller can take actions to affect the quality of the good traded): all of these may be important in determining the nature and length of contracts. Third, by considering a finite horizon model we have ignored reputational concerns. But in practice these are obviously important in determining how parties negotiate or renegotiate contracts, how they react to not getting what they feel entitled to (whether they shade or not), whether they are wiling to match outside options, etc.

Finally, we have assumed that the parties have a clear choice between writing a short-term or a continuing contract. But in practice even a short-term contract may create obligations between the parties that require them to treat each other with good faith in the event that they trade again. In other words a short-term contract may merge into a continuing contract. To understand what contracts are feasible requires a theory of how obligations are determined, including whether parties can manipulate or design notions like good faith or instead must take them as given[23]. This is a challenging research agenda that seems an important complement to what we have done here.

[22] For a preliminary analysis of indexation, see Halonen-Akatwijuka and Hart (2013).

[23] If the parties were able to design good faith without constraints they could choose it to mean that the parties must split the ex post surplus 50:50. In our context of symmetric information and no noncontractible specific investments a long-term, short-term, and continuing contract would then all achieve the first-best. While splitting the surplus is a familiar idea when value and cost are verifiable, it is not something that we see, or that one can easily imagine being implemented, in other contexts such as ours. Exactly why remains an open question.

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