DIVISION OF THE HUMANITIES AND SOCIAL SCIENCES

CALIFORNIA INSTITUTE OF TECHNOLOGY

PASADENA, CALIFORNIA 91125

EFFICIENT RELIANCE AND CONTRACT REMEDIES

William P. Rogerson

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ABSTRACT

Parties to a contract often must engage in expenditures prior to the performance of the contract to either prepare for or make use of the performance of the contract. Legal institutions provide for contract enforcement either by specifically enforcing contractually specified actions or by requiring that the breacher pay the breachee an amount of money called damages. This paper analyzes the impact of varying the enforcement institution on the incentives to rely. An unambiguous ranking of specific performance and five damage measures is obtained in terms of efficiency of the reliance decision.

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INTRODUCTION

The essential element of a contract is time: parties promise at some earlier date to perform specified actions at some later date. There are three broad classes of reasons people might want to enter such an arrangement. First, at the earlier date events out of control of either of the parties may still be uncertain. A contract can be a futures contract, transferring this exogenous uncertainty to those more willing to bear it. Second, at the earlier date events which can be affected by one of the parties may be subjectively uncertain to the other party. A contract can remove this endogenous uncertainty. The third reason is not associated with allocation of exogenous or removal of endogenous risk: it also applies to risk neutral people. The value of performance at the later date to one of the people might be much larger if he engages in some other activity ahead of time. For example, a rock promoter hiring a band can increase the value of the exchange to himself by advertising before the concert date. Expenses incurred prior to an exchange in anticipation of the exchange are called reliance. A party to an exchange may be unwilling to engage in any reliance at all without some assurances that the other party will exchange at a previously agreed price. By this it is not meant that the relier needs the variance of the price of exchange reduced. This falls under the second reason for contracting. Rather, he requires that its expected value be raised. If negotiations occur after the relier engages in reliance, he may be in a very weak negotiating position since he will lose money unless the other party to the exchange performs. The relier's expected return to reliance may be quite low or even negative in the absence of a contract which the relier can negotiate prior to relying.

In the extreme case, this may mean that no exchange occurs, although both parties could have benefited from it. More generally, the relier may engage in less reliance than if he were assured of a particular price of exchange, and even though the exchange occurs, it does not generate nearly the aggregate value that it might have. Both parties could have been made better off had there been some manner of assuring one another's performance. A contract can do this. I will call this third function of contracts "assuring performance."

Were it not for exogenous uncertainty and transactions and information costs, there would be no problem to analyze. In this case, a law that all contracts must be honored would induce efficient behavior. For the case of no exogenous uncertainty, parties to the potential exchange enter a contract if and only if

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a price exists which makes them both better off. The parties then maximize their own return by choosing levels of reliance which also maximize the aggregate value.

However, the case where exogenous uncertainty exists is not so simple. As examples of exogenous uncertainty, the cost of production may depend on the amount of rain that falls, or the buyer may be purchasing the good for resale and is uncertain of the future price. In this case, the efficient solution typically involves some reliance but no exchange if the cost of the seller rises too high or the value to the buyer drops too low. A simple legal provision that all contracts must be enforced does not induce this efficient behavior if the contract simply specifies that an exchange shall occur. Instead, the contract has to specify the complete set of contingencies and whether the exchange shall occur or not under each one.

In a world of zero transaction costs and costless gathering and processing of information, this is the "ideal" solution; parties to the contract guarantee that the exchange produces the maximum aggregate value and the negotiated price divides it between the two. However, drafting and, particularly, negotiating exhaustive contracts is expensive. The list of possible contingencies could be almost endless. Furthermore, a number of the contingencies may be internal to one of the parties and very difficult to verify. This would allow the possibility of misrepresentation. For example, a seller's costs might rise enough that he would not want to exchange even though the contract specifies that he must; if his production process was

complex he might easily be able to argue that costs had risen even more so that the exchange should not take place according to the contract. The alternative would be to only specify contingencies external to the firm instead of using the cost variable. However, to do this both parties would essentially have to agree on what the firm's production function was; this is clearly an extremely costly process. In summary, to arrive at an efficient contract by this method would essentially amount to an exchange of all information and then joint calculation of an optimum. This process sacrifices the low cost, low information, and incentive-compatible properties of more decentralized decision making processes. Of course, some contingencies are important enough and easily verifiable enough that they are included in contracts; however, a large mass of contingencies are generally left unspecified in contracts.

How, then, does a contract which simply specifies that an exchange will occur provide assurances of performance for the relier? The law could still (and does at times) provide for specific performance -- the relier could have the right to force the breacher to perform. More typically, a damage measure is embedded in the law which provides that a party to a contract who breaches must pay the breachee an amount of money called damages. In either case, the institutions tend to provide assurances of performance by allowing the relier a private return to his reliance even in the event that breach is the efficient course of action. That is, the relier is insured to some extent against the possibility that his reliance may have no social return. As with many kinds of insurance, a moral hazard is created. In this case, the nature of the moral hazard is that the relier tends to over-rely. By solving the problem of under-reliance due to the lack of assurances of performance, we create a problem of over-reliance due to moral hazard.

The purpose of this paper is to compare the amount of moral hazard generated by different damage measures and by specific performance. The formal analysis is done in a particularly simple environment. I assume that the buyer and seller only specify in their contract that an exchange will occur at a fixed price. This is the situation encountered under high transaction and information costs. Only the buyer makes a reliance decision and only the seller's cost of production and the size of third party offers to purchase are subject to uncertainty at the time of contracting. The participants are risk neutral to avoid muddying the analysis of efficient reliance and breach with that of efficient allocation of exogenous risk or removal of endogenous risk. I assume that both participants measure the value of the good to themselves in dollars. Together with the preceding assumptions, this means that participants will measure the value of a contract to themselves in expected value of dollars. If both parties are firms this assumption is fairly natural. See Rogerson (1980) for a discussion of this case where one of the parties is a consumer. This means that we can simply add the value of the contract to both players to obtain an efficiency index. A contract with a higher aggregate value is more efficient. Notice that the buyer and seller would always choose a more efficient institution over a less efficient one because in the former case

they could negotiate a price which would make them both better off.

Shavell (1978) was the first person to point out that damage measures might distort the reliance decision. The analysis of this paper owes a debt to that of Shavell, but is substantially different for the following reasons. First, the agents are allowed to negotiate away potentially inefficient breach behavior at the given level of reliance. Modelling this process requires that the relier form expectations over payoffs resulting form negotiations that will occur at a future time. (This same model is also used to formally demonstrate that reliance is in general too small without assurances of performance.) Second, third party offers to purchase are considered separately from costs of production. This allows a distinction to be drawn between restitution and expectation damages. As well, it allows a clearer picture of the information requirements for the various institutions. Third, a distinction is made between the case where a market for substitute performance exists and the case where no market for substitute performance exists. The ranking of institutions is substantially affected by this factor. Fourth, liquidated damages, restitution damages, and specific performance are considered, as well as expectation damages and reliance damages.

II THE MODEL

The buyer of the good intends to use the good as an input in some production process and to sell the result or to consume the good himself. In either case he can engage in reliance, r. The value of the good to him is then v(r). Therefore, the net value of the good to him is

$$v(r) - r. \tag{1}$$

If the buyer engages in reliance and no exchange takes place, he may be able to obtain some scrap value for the reliance or, if he is not so lucky, may have to pay a disposal cost. Let $\bar{v}(r)$ denote this amount. Therefore the value of no exchange to him is:

$$\bar{v}(r) - r. \tag{2}$$

Assume that:

(i) v and $\bar{v}$ are defined and continuous over $[0,\infty)$,

(ii) v(r) - r has a unique global maximum at r_e, (3)

(iii) $v(r) - \bar{v}(r)$ is nondecreasing,

(iv) $\bar{v}(r) - r$ is decreasing.

Assumption (ii) means that even if we are sure the good will be produced and exchanged, eventually some optimal level of reliance is reached; past some point the net return to reliance begins to decline. The assumption of uniqueness is for technical convenience. Assumption (iii) means that engaging in reliance for its primary

purpose is at least as profitable as engaging in reliance for its scrap value. Assumption (iv) means that engaging in reliance solely to sell it as scrap is unprofitable; the buyer would only engage in reliance if there were some hope of purchasing the good. Note in particular that no convexity assumptions need to be made.

The seller produces the good at a cost of c. This cost varies randomly; the realization of the random variable is unknown at the time r is chosen. Let k be the best other offer that the seller of the good receives for his good between the time the contract is entered and the time that the exchange is supposed to occur. If a market for the good exists, k is the market price at the time of exchange. The realization of k is unknown at the time the contract is entered and the reliance decision is made. Assume without loss of generality that c and k are defined over the probability space [0,1] with Lebesgue measure. Let θ denote an element of [0,1]. Assume that c is always non-negative and k is bounded from below. This simply means that it costs at least zero to produce the good and the market price is bounded from below.

If the good in question is not unique and the buyer of the good intends to use the good as an input in some production process and to sell the result we might expect that a rise in price, k, would also cause a rise in the price in the market for the buyer's output. As a consequence v(r) would also rise. In this case, interpret k as the net increase in price in the input market after the price increase in the output market is accounted for. Therefore, the same mathematics applies to this more complex case. For ease of exposition I will address the simpler case where v is not random.

The buyer and seller negotiate a contract which states that exchange will occur at a price, p. Six types of contract enforcement institutions will be considered. Specific performance is the simplest. The buyer has the right to demand that the exchange occur at p. Under reliance damages, the breacher must compensate the relier for all non-recoverable reliance expenditures. Therefore the seller must pay the buyer $r - \bar{v}(r)$ if the seller breaches.

The definition of expectation damages is more complex. This is the damage measure currently in general use in the courts. Its intention is to put the relier in the same financial position as if the contract were carried out. Suppose first that a competitive market exists where substitute performance can be purchased. If the buyer uses the good himself he would receive

$$v(r) - r - p. \tag{4}$$

However, if he sold to the highest alternative buyer he would receive

$$\bar{v}(r) - r - p + k. \tag{5}$$

Therefore, assuring the buyer of a level of profits equal to that

he would have received had performance occurred amounts to assuring him the maximum of (4) and (5). If the breaching seller pays the buyer

$$k - p \tag{6}$$

the buyer can decide which of (4) or (5) to receive by deciding whether or not to purchase substitute performance.

In many cases, however, there is no market for substitute performance. The most obvious case is where the good in question is unique. However, at least two other cases also arise. Sometimes there are many types of the good but the reliance is only useful for one type. For example, a rock promoter could hire any band but once he has hired Abba and advertised that Abba is coming and sold tickets to an Abba concert, some other rock band cannot provide substitute performance. Time is sometimes a crucial variable. If the seller breaches too close to the date of performance and it is crucial that the performance occur precisely at that time, no substitute performance may be obtainable on such short notice. In the extreme, the breacher may not indicate that he is breaching until the moment of expected performance. Notice that when time plays this role specific performance is not a possibility.

Expectation damages when no market for substitute performance exists are defined by

$$v(r) - \bar{v}(r) - p \tag{7}$$

When these are paid to the buyer (who sells his reliance for $\bar{v}(r)$) the buyer's net return is

$$v(r) - r - p \tag{8}$$

which is what he would have received had he received the good and used it himself.

This definition of expectation damages for the case of no market for substitute performance is the one the courts generally use. However, when $k > v - \overline{v}$, this rule may result in the situation where the seller breaches and sells the good to the third party for k. The seller's net profit over the case where he sells to the original buyer is $k - v(r) - \overline{v}(r)$. If one believed that the original buyer could also have resold the item for k to the third party, then protecting his expectation interest requires that damages be the maximum of (7) and $k - p$, where k is now the price that the breaching seller sold to a third party for. I will call this variant of expectation damages ideal restitution damages.

I call this variant "ideal" restitution damages because although it will be seen to possess good properties, the courts could probably not administer it. To do so, the courts would have to be able to determine what the highest third party offer to purchase was. Such a process would generally be prohibitively expensive and error-prone, if not impossible. I will call a more feasible variant of this damage measure restitution damages. Under restitution damages the seller pays expectation damages if he elects to sell to no one. However, if he elects to sell to a third party he pays the maximum of $k - p$ and expectation damages. Note that under both ideal

restitution damages and restitution damages the seller never has an incentive to sell to a third party.

Liquidated damages is the last damage measure that will be considered. Under this measure, parties specify in the contract a sum of money which the seller must pay the buyer in the event of breach.

III A MARKET FOR SUBSTITUTE PERFORMANCE EXISTS

We measure the efficiency of the outcome by summing the value to the buyer and seller. Three decisions affect the aggregate value generated--the amount of reliance engaged in by the buyer; whether or not the seller produces the good; and whether the buyer consumes the good produced by the seller, some other good or no good at all. Let P_1 be those values of θ such that the seller produces the good and the buyer consumes it or some other good. Let P_2 be those values of θ such that the seller produces the good and the original buyer does not consume a good. Let P_3 be those values of θ such that the seller does not produce the good and the buyer buys a good from someone else. Let P_4 be all other values of θ. Then the aggregate expected value of the exchange can be written as a function of r, P_1, P_2, P_3, and P_4. Let λ denote Lebesgue measure. Let F be the function determining aggregate value of the exchange.

$$F(r,P_1,P_2,P_3,P_4) = \int_{P_1} v(r) - r - c(\theta)d\lambda$$
$$+ \int_{P_2} \overline{v}(r) - r + k(\theta) - c(\theta)d\lambda$$

$$+ \int_{P_3} v(r) - r - k(\theta) d\lambda$$

$$+ \int_{P_4} \overline{v}(r) - r d\lambda$$

<u>Proposition 1</u>:

Define the following four sets:

$$P_1^*(r) = \{\theta : c(\theta) \leq k(\theta) \wedge v(r) - \overline{v}(r) \geq k(\theta)\} \tag{11}$$

$$P_2^*(r) = \{\theta : c(\theta) \leq k(\theta) \wedge v(r) - \overline{v}(r) < k(\theta)\} \tag{12}$$

$$P_3^*(r) = \{\theta : c(\theta) > k(\theta) \wedge v(r) - \overline{v}(r) \geq k(\theta)\} \tag{13}$$

$$P_4^*(r) = \{\theta : c(\theta) > k(\theta) \wedge v(r) - \overline{v}(r) < k(\theta)\} \tag{14}$$

Then for any $r \in [0,\infty)$, $P_1^*(r), P_2^*(r), P_3^*(r)$, and $P_4^*(r)$ uniquely (up to inclusion or exclusion of sets of measure zero) maximize $F(r,P_1,P_2,P_3,P_4)$.

<u>Proof</u>:

Obvious. □

The intuition of Proposition 1 is clear. It is efficient to produce if and only if the cost of production is less than or equal to the market price. It is efficient to consume if and only if the marginal benefit from consumption is greater than or equal to the market price. Define $f(r)$ as the function yielding an aggregate value for r when P_1, P_2, P_3, and P_4 are chosen optimally.

$$f(r) = F(r,P_1^*(r),P_2^*(r),P_3^*(r),P_4^*(r)) \tag{15}$$

<u>Proposition 2</u>:

The function $f(r)$ is continuous on $[0,\infty)$. Furthermore $f(r_e) > f(r)$ for all $r > r_e$. Therefore f achieves a global maximum and all such global maximums occur in $[0,r_e]$.

<u>Proof</u>:

See Appendix. □

Therefore an optimum level of reliance exists. Let R be the set of all such levels of reliance. (The maximum may not be unique.) By referring to the proof it is easy to see that r_e will generally not be an element of R. This is true, for example, if f is differentiable. Loosely speaking, the element r_e will be in R when v exhibits a large kink at r_e. The most interesting observation to be made about the case where a market for substitute performance exists is that in the absence of any contract institution, the buyer and seller will act optimally.

<u>Proposition 3</u>:

When a market for substitute performance exists, the buyer and seller act optimally in the absence of a contract institution.

Proof:

See Appendix. □

The proof is simple. The buyer will consume the good if and only if $v(r) - \overline{v}(r) \geq k$; otherwise he is better off reselling it. The seller will produce the good if and only if his costs of production are less than or equal to the market price. The only real question is whether the buyer relies optimally. He does so because he experiences all the marginal social costs and benefits when he varies r. Therefore risk neutral parties do not need a contract institution when a market exists. There is no need for the relier to be assured of performance for optimal reliance to occur because his negotiating position is not damaged when he relies. He can purchase at the market price regardless of his level of reliance.

Even though no contract institution is needed to assure performance in the case where a market for substitute performance exists, it is still interesting to determine how much moral hazard exists, because a contract institution may be in use for one of the other two reasons outlined in the introduction. Expectation damages is easiest. The buyer and seller consume and produce optimally (i.e., the buyer consumes if and only if $v(r) - \overline{v}(r) \geq k$ and the seller produces if and only if $c \leq k$). The buyer can view himself as always receiving the good at price p. (If the seller honors, this is automatically so. If the seller breaches, the buyer receives enough money so he need pay only p more dollars to purchase

the good. If the buyer breaches, he must pay enough money so it would still cost him in total p dollars to buy the good or the market.) The buyer relies optimally in this case. Specific performance is equivalent to expectation damages when a market for substitute performance exists because the seller will purchase a good on the market to fulfill his contract obligation if $c > k$. Therefore specific performance also results in efficient behavior. Proposition 4 states these results.

Proposition 4:

When a market for substitute performance exists, the buyer and seller act optimally using either expectation damages or specific performance.

Proof:

See Appendix. □

Therefore, when a market for substitute performance exists, most of the problems of concern in this paper vanish. The relier needs no assurances of performance to rely efficiently. The institutions of expectation damages and specific performance produce no moral hazard and result in efficient allocation of resources. In the next section it will be seen that both problems exist in the absence of a market for substitute performance.

IV. NO MARKET FOR SUBSTITUTE PERFORMANCE EXISTS

A. Efficient Behavior

Once again we measure the efficiency of the outcome by summing the value to the buyer and seller. The same three decisions affect the aggregate value generated, except that now the buyer does not have the option of consuming some other substitute good if the seller breaches. Let P_1 be those values of θ such that the good is produced and the buyer consumes it. Let P_2 be those values of θ such that the good is produced and a third party consumes it. Let P_3 be those values of θ such that the good is not produced. Then the aggregate value of the exchange can be written as a function of r, P_1, P_2 and P_3. When possible, I will re-use the same symbols that were used for the corresponding expressions in section III since the analysis is very similar. Let F denote the aggregate expected value of an exchange.

$$F(r,P_1,P_2,P_3) = \int_{P_1} v(r) - r - c(\theta)d\lambda + \int_{P_2} \bar{v}(r) - r + k(\theta) - c(\theta)d\lambda + \int_{P_3} \bar{v}(r) - rd\lambda \qquad (16)$$

Proposition 5:

Define the following three sets:

$$P_1^*(r) = \{\theta : c(\theta) \le v(r) - \bar{v}(r) \wedge v(r) - \bar{v}(r) \ge k(\theta)\} \qquad (17)$$

$$P_2^*(r) = \{\theta : c(\theta) \le k(\theta) \wedge k(\theta) \ge v(r) - \bar{v}(r)\} \qquad (18)$$

$$P_3^*(r) = \{\theta : c(\theta) > v(r) - \bar{v}(r) \wedge c(\theta) > k(\theta)\} \qquad (19)$$

Then for any $r \in [0,\infty)$, $P_1^*(r)$, $P_2^*(r)$, and $P_3^*(r)$ uniquely (up to inclusion or exclusion of sets of measure zero) maximize $F(r,P_1,P_2,P_3)$.

Proof:

The proof is similar to that of Proposition 1. □

Figure 1 illustrates Proposition 5.

FIGURE I

AGGREGATE RETURN TO RELIANCE

θ is such that the largest of $\{v - \bar{v}, c, k\}$ is	Joint value
$v - \bar{v}$	$v - r - c$
k	$k - \bar{v} - r - c$
c	$\bar{v} - r$

If θ is such that the most profitable course of action for the buyer and seller is to honor the contract, then reliance is useful up to r_e

However, if θ is such that the most profitable course of action is for a third party to consume the good or for no production to occur then, ex post, reliance always exhibits a negative return. Therefore, no matter what happens, it is never profitable to rely past r_e. Define f(r) as the function yielding aggregate value for r when P_1, P_2, and P_3 are chosen optimally.

$$f(r) = F(r, P_1^*(r), P_2^*(r), P_3^*(r)). \tag{20}$$

Let R be the set of values for r which maximize f.

Proposition 6:

The function f(r) is continuous on $[0,\infty)$. Furthermore, $f(r_e) > f(r)$ for all $r > r_e$. Therefore, f achieves a global maximum and all such global maximums occur in $[0,r_e]$.

Proof:

The proof is similar to that of Propsition 2. □

Therefore an optimum level of reliance exists. Let R be the set of all optimal levels of reliance. As for Proposition 2, r_e will generally not be an element of R unless v exhibits a large kink at r_e.

B. Negotiations

In the analysis that follows, it is necessary on four

separate occasions to model the process by which the buyer forms expectations over a future uncertain payoff to be determined by negotiations between the buyer and seller. It seems most economical to present a model of this process at the outset. The four situations where the buyer needs to form these expectations in order to make his reliance decision are as follows. The first instance occurs if no contract is entered. The buyer may still choose to rely to some extent and then negotiate a price with the seller at the time of exchange. The other three instances occur when a contract institution would produce inefficient breach behavior conditional on the level of reliance. It seems likely that a negotiation involving a side payment would remove any such inefficiency. This situation occurs for specific performance, reliance damages, and restitution damages. (Ideal restitution damages, expectation damages, and liquidated damages result in efficient behavior conditional on the level of reliance without post contract negotiations.)

In all cases, there is a natural upper and lower bound on the size of the side payment determined by what the agents could secure for themselves in the absence of cooperative action. The agents can therefore be viewed as essentially negotiating over how to divide up a sum of money -- the difference between the upper and lower bound. I assume that there exists a number α in the interval [0,1] such that the buyer expects to receive α of the sum of money. The number α is thus an index of negotiating strength. As α grows larger the buyer feels that he will secure more of the rent from any negotiation. When the analysis of the subsequent sections is read it will become clear that it is only necessary for the buyer to use the same value for α within each case. (Recall there are four cases.) The buyer may use a different value of α for each of the four cases and all propositions are still true. The same symbol, α, is used in all four cases for notational convenience.

Under the assumption that post-contract negotiations always occur to remove inefficiencies at the given reliance level the size of α reflects the relier's expectations of his strength in the upcoming negotiations. However, these negotiations may not always result in efficient behavior due to bluffing or poor information, for example. As well, these negotiations are costly and thus consume some of the returns they generate. In this more general context a lower value of α can be generated by a higher expected negotiation cost or higher probability of arriving at no agreement. I will formally refer to α merely as an indicator of negotiating strength for ease of exposition.

This model of negotiations performs two functions in the later analysis. First, it establishes that the expected payoff from negotiations to the relier depends on his financial position in the absence of cooperation. This latter variable is of course affected by his reliance decision. Second, it establishes that the first effect is manifested in a smooth, regular fashion. In particular, if the buyer can increase his expected return in the absence of cooperation, he will also increase his return from negotiations.

When the seller has an incentive to make an inefficient breach or sales decision at the given level of reliance, the buyer's

return to reliance is the same if we assume that no post-contract negotiations occur or if we assume that post-contract negotiations occur but that the buyer receives none of the increase in joint returns (i.e., α equals 0). However, these two cases are not equally efficient. At least when there are no transactions costs and where post-contract negotiations always produce agreement, the case of post-contract negotiations and α equals zero produces a joint return of $f(r)$, while the case of no post-contract negotiations produces a smaller joint return. Therefore, to compare efficiency of institutions by comparing the values f assumes under the reliance decisions they generate, requires the assumption that post-contract negotiations occur to the same extent and at the same cost under all the institutions.

C. Behavior with No Contract

If no contract is entered, the buyer must first choose a level of reliance. The realization of θ then occurs and the buyer and seller negotiate a price to exchange at, if they exchange. The negotiated price must always be greater than or equal to the maximum of $c(\theta)$ and $k(\theta)$ and less than or equal to $v(r) - \bar{v}(r)$. If the price was below $c(\theta)$, the seller would find it more profitable to not produce. If it was below $k(\theta)$ the seller would find it more profitable to sell to the third party. If it was above $v(r) - \bar{v}(r)$, the buyer would be better off simply be selling his reliance for scrap. Therefore, in terms of the framework in Section B, the buyer expects to exchange if and only if

$$\max\{c(\theta),k(\theta)\} \leq v(r) - \bar{v}(r) \qquad (21)$$

in which case he expects to receive

$$\alpha(v(r) - r - \max\{c(\theta),k(\theta)\}) + (1 - \alpha)(\overline{v}(r) - r). \qquad (22)$$

Let $b(r,\alpha)$ be his expected return from reliance, r, given his subjective expectations, α.

$$b(r,\alpha) = \int_{P_1^*(r)} \Big\{\alpha(v(r) - r - \max\{c(\theta),k(\theta)\}) + (1 - \alpha)(\overline{v}(r) - r)\Big\} d\lambda + \int_{P_2^*(r) \cup P_3^*(r)} \overline{v}(r) - r d\lambda. \qquad (23)$$

Proposition 7 shows that the reliance decision is, in general, too small. Furthermore, the extent to which the reliance decision is inefficient depends in a monotonic fashion on how confident the buyer is of his negotiating strength. If the buyer has absolutely no confidence in his negotiating strength, he engages in no reliance. This may mean that no exchange ever takes place. As the buyer's confidence increases, his reliance decision grows until, finally, if he expects to receive the maximum possible in all negotiation situations, he relies efficiently. Furthermore, not only his level of reliance but also its efficiency grow monotonically with his confidence level. (This is true even though f may not be monotonically increasing in r over $[0,r_e]$.)

Comparison of Figure 1, which diagrams the aggregate returns to reliance, and Figure 2, which diagrams the buyer's returns to

reliance under no contract provides intuition into these results.

FIGURE 2

BUYER'S RETURN TO RELIANCE UNDER NO CONTRACT

θ is such that the largest of $\{v - \overline{v}, c, k\}$ is	Value to Buyer
$v - \overline{v}$	$\alpha[v - r - \max\{c,k\}] + (1 - d)[\overline{v} - r]$
k	$\overline{v} - r$
c	$\overline{v} - r$

The marginal return to reliance when k or c is largest is the same under both schemes. However in Figure 2 the marginal return to reliance is less when it is optimal for the buyer to receive the good. It is less to the extent that the seller can bargain away the rents associated with performance. Since the return to reliance is smaller, the buyer relies less.

<u>Proposition 7</u>:

The function $b(\cdot,\alpha)$ achieves its supremum. Let $N(\alpha)$ be the set of all values for r such that $b(\cdot,\alpha)$ is maximized. Then

(i) $N(1) = R$

(ii) $N(0) = \{0\}$

(iii) If $\alpha_1 < \alpha_2$ then $\sup N(\alpha_1) \leq \inf N(\alpha_2)$.

(iv) If $\alpha_1 < \alpha_2$ then $\sup \{f(r):r \in N(\alpha_1)\} \leq \inf \{f(r):r \in N(\alpha_2)\}$

(v) N is an upper hemi continuous correspondence.

Proof:

See Appendix. □

It is interesting to note that Proposition 7 does not depend on any concavity assumptions concerning v. In particular, even though f may have numerous local maximums and non-concavities, as α goes up, $f(N(\alpha))$ also goes up (Proposition 7: iv). The correspondence N "passes over" values of r such that f(r) is decreasing. The entire proof is driven by the assumption that $\overline{v}(r) - r$ is decreasing. See Lemma 3 in the Appendix for an explanation of the nature of the proof. This observation can be made about the succeeding propositions as well, but will only be made here for economy of presentation.

D. Behavior Under Expectation Damages

The buyer always receives $v(r) - r$. If the seller breaches the buyer simply receives a net of $v(r) - r$ dollars. If the seller produces, he gives the good to the buyer if and only if $v(r) - \overline{v}(r) \leq k(\theta)$. Otherwise he sells to a third party and pays the original buyer damages. Therefore, the buyer never has a resale opportunity and he receives $v(r) - r$ if the contract is honored. Recall that the unique global maximum to $v(r) - r$ occurs at r_e. The buyer clearly chooses r_e under expectation damages. By Proposition 6, the reliance choice of the buyer is generally larger than the efficient level of reliance. This observation was first made by Shavell (1978). The buyer is insured against both third party offers

and cost rises which render performance inefficient. Even though there is no social return to reliance in these cases, the buyer receives a private return to this reliance. Not surprisingly, the buyer thus over-relies.

E. Behavior under Reliance Damages -- No Post-Contract Negotiations

The buyer receives

$$\max\{v(r) - r - p,\ k(\theta) + \overline{v}(r) - r - p\} \tag{24}$$

if the seller honors the contract, since the buyer has the option of reselling to a third party, and 0 if the seller breaches. The seller receives

$$p - c(\theta) \tag{25}$$

if he honors the contract,

$$k(\theta) - c(\theta) - r + \overline{v}(r) \tag{26}$$

if he sells to a third party, and

$$-r + \overline{v}(r) \tag{27}$$

if he does not produce.

Now consider the following three expressions:

$$p + r - \overline{v}(r) \tag{28}$$

$$c(\theta) \tag{29}$$

$$k(\theta) \tag{30}$$

From the above, the seller honors the contract if (28) is the largest of the three; he does not produce if (29) is the largest of the three; he sells to the third party if (30) is the largest of the three. If two or more of the terms are tied for largest, he is indifferent between the actions associated with them. I will assume that if (28) is involved in a tie for the largest, the seller honors. If (29) and (30) are tied for the largest, I will assume that the seller sells to the third party. Let $H(r,p)$ be all values of θ such that the seller honors the contract. Let $B_1(r,p)$ be the values such that the seller sells to the third party and let $B_2(r,p)$ be the values such that the seller does not produce. Let $B(r,p) = B_1(r,p) \cup B_2(r,p)$.

Now suppose that $v(r) > p + r$. Then it is clear that

$$H(r,p) \subseteq P_1^*(r)$$

$$B_1(r,p) \supseteq P_2^*(r)$$

$$B_2(r,p) \supseteq P_3^*(r). \tag{31}$$

If $v(r) = p + r$, then

$$H(r,p) = P_1^*(r)$$

$$B_1(r,p) = P_2^*(r)$$

$$B_2(r,p) = P_3^*(r). \tag{32}$$

If $v(r) < p + r$, then

$$H(r,p) \supseteq P_1^*(r)$$

$$B_1(r,p) \subseteq P_2^*(r)$$

$$B_2(r,p) \subseteq P_1^*(r) \tag{33}$$

That is, if the buyer makes a profit from relying and receiving the good, the seller does not give the good to him often enough. If the buyer makes zero profits from relying and receiving the good, the seller acts efficiently. If the buyer makes negative profits from relying and receiving the good, then the seller honors the contract more often than is efficient.

In the following paragraph I show that the buyer will never choose an r and p such that $v(r) - r - p < 0$, because if this is true then the buyer makes at best expected profits of zero and generally makes negative expected profits. Suppose that $v(r) - r - p < 0$. Then if $\theta \in H(r,p)$, we also know that $k(\theta) + \bar{v}(r) - r - p \leq 0$ so that the buyer at best makes zero profits. If $\theta \in B_1(r,p) \cup B_2(r,p)$ the buyer makes zero profits. Therefore the buyer makes at best zero profits and there is no incentive for him to have entered the contract.

Because of the observation in the last paragraph, it is reasonable to assume that at the value of p chosen by the buyer and seller the set of values for r such that $v(r) - r - p \geq 0$ is nonempty. By the above, the buyer also chooses his reliance level from this set. The buyer's expected return to reliance is

$$\int_{H(r,p)} \max\{v(r) - r - p, k(\theta) + \bar{v}(r) - r - p\} d\lambda + \int_{B(r,p)} 0 d\lambda \tag{34}$$

However, if $\theta \in H(r,p)$, then $k(\theta) + \bar{v}(r) - r - p \leq 0$, because (30) is less than or equal to (28). Therefore, we can rewrite (34) as

$$a(r,p) = \int_{H(r,p)} v(r) - r - p d\lambda \tag{35}$$

over the domain where (34) is non-negative. As well, (34) is negative if and only if (35) is negative. Therefore r* maximizes (34) if and only if r* maximizes (35).

The deduction that the buyer chooses r to maximize a(r,p) allows the fairly immediate conclusion that the buyer's choice of reliance will be at least as large in this case as for the case of expectation damages. The buyer receives $v(r) - r - p$ when the seller honors, just as in the expectation case. However, now the buyer receives nothing if the seller breaches. Therefore he has an incentive to choose a larger r to encourage the seller to honor more often. Analogously to the previous propositions, because of the generality of the assumptions the formal statement of the proposition allows the possibility that the reliance choice under reliance damages will equal that under expectation damages. However, this will only happen in special cases such as where $v(r) - r$ has a large "kink." Generally, the reliance choice under reliance damages will be larger.

<u>Proposition 8 (Shavell)</u>:

Suppose that there exists an r such that $v(r) - r - p \geq 0$. Let A(p) be the set of values of r which maximize a(r,p). Then

(i) $r \in A(p) \Rightarrow r \geq r_e$ for every p.

(ii) If there exists an $\bar{r}$ such that $v(r) - r < 0$ for every $r \geq \bar{r}$, then $A(p) \neq \emptyset$ for every p.

<u>Proof</u>:

See Appendix. □

Using expressions (31)-(33) and the fact that $v(r) - r - p \geq 0$ at the chosen level of reliance, the seller's choices are biased away from efficiency at the given level of reliance in the following fashion. The seller will sometimes not produce when it would have been more efficient to produce and honor the contract. He will sometimes produce and sell to the third party when it would have been more efficient to honor the contract. However, he produces and sells to a third party if and only if this is more efficient than not producing. Therefore the efficiency of reliance level r is less than or equal to f(r), which is the efficiency achieved if the seller and buyer act optimally given the reliance level r. To show that the institution of reliance damages is no more efficient than that of expectation damages, it is thus sufficient to show that

$$f(r_e) \geq \sup\{f(r): r \in A(r)\}. \tag{36}$$

However, this is automatically true by Proposition 6 since $r \in A(p)$ implies that $r \geq r_e$.

Proposition 9 (Shavell):

Under the assumption of no post-contract negotiations, the institution of reliance damages is no more efficient than that of expectation damages.

Proof:

As above. □

F. Behavior under Reliance Damages -- Post-Contract Negotiations

In the last section the buyer assumed that the seller's breach behavior would not be efficient at the given level of reliance. To maximize his own return the seller sometimes does not honor the contract when doing so would actually increase the joint return of the buyer and seller. In this situation the potential exists for the buyer and seller to negotiate a side payment from the buyer to the seller in return for the seller honoring the contract. I call these negotiations "post-contract negotiations." The most interesting effect of these negotiations for this analysis is that the relier takes them into account when making his reliance decision, and in general this changes his reliance decision.

It is once again possible to show that if $v(r) - r - p < 0$

the buyer makes at best zero expected profits and generally makes negative expected profits. I will not present the proof since it is essentially the same as the analogous proof in section E. As in section E, I assume that at the value of p chosen by the buyer and seller there exists an r such that $v(r) - r - p \geq 0$. The buyer always chooses an r such that $v(r) - r - p \geq 0$. The expected return to reliance over this domain is

$$a^*(r,p,\alpha) = \int_{H(r,p)} v(r) - r - p d\lambda$$
$$+ \alpha \int_{P_1^*(r) \cap B_1(r,p)} v(r) - \bar{v}(r) - k(\theta) d\lambda$$
$$+ \alpha \int_{P_2^*(r) \cap B_2(r,p)} v(r) - \bar{v}(r) - c(\theta) d\lambda \tag{37}$$

The return to reliance under no post-contract negotiations, (35), differs from (37) in that (37) has the extra term

$$\alpha \int_{P_1^*(r) \cap B_1(r,p)} v(r) - \bar{v}(r) - k(\theta) d\lambda$$
$$+ \alpha \int_{P_2^*(r) \cap B_2(r,p)} v(r) - \bar{v}(r) - c(\theta) d\lambda.$$

The marginal return to increased reliance from this extra term may be positive or negative and as a consequence it cannot be stated in general whether reliance under post-contract negotiation is smaller or larger than reliance under no post-contract negotiations. However one observation can be made. Reliance is still at least as large as r_e. Shavell's original observation that reliance damages produce an overly large reliance decision under no post-contract negotiations thus generalizes to the case of post-contract negotiations. By Proposition 6, therefore, reliance damages under post-contract negotiations produce a less efficient outcome than expectation damages. The intuition for this result is similar to that for Proposition 8. The relier has an incentive to over-rely in order to force the producer to honor the contract.

<u>Proposition 10</u>:

Suppose that there exists an r such that $v(r) - r - p \geq 0$. Let $A^*(p,\alpha)$ be the values of r which maximize $a^*(\cdot,p,\alpha)$. Then

(i) $r \in A^*(p,a) \Rightarrow r \geq r_e$ for every (p,α).

(ii) If $v(r) - r - p$ is eventually negative for all large enough values of r, then $A^*(p,\alpha) \neq \emptyset$ for every (p,α).

(iii) Therefore under post-contract negotiations, reliance damages are less efficient than expectation damages.

<u>Proof</u>:

See Appendix. □

G. Behavior under Restitution Damages -- No Post-Contract Negotiations

Under restitution damages the seller pays expectation

damages if he elects to sell to no one. However, if he elects to sell to a third party he pays the maximum of k - p and expectation damages. The seller, therefore, never has an incentive to sell to a third party. At best, he is indifferent between this option and performing. Since the buyer also receives the same return regardless, I will assume for analytical simplicity that the seller never sells to a third party. It is easy to see that the seller produces and honors the contract if and only if $c \leq v(r) - \bar{v}(r)$. Therefore the buyer's expected return to reliance can be written

$$e(r,p) = \int_{\{\theta\,:\,c(\theta) \leq v(r) - \bar{v}(r)\}} \max\left\{\begin{matrix} v(r) \\ k(\theta) + \bar{v}(r) \end{matrix}\right\} - r - p\,d\lambda$$

$$+ \int_{\{\theta\,:\,c(\theta) > v(r) - \bar{v}(r)\}} v(r) - r - p\,d\lambda\,. \tag{38}$$

Comparison of (38) with the expected return to reliance under expectation damages reveals that the reliance choice under restitution damages is less than or equal to the reliance choice under the other institution. This is because the buyer is only partially insured against the fact that it may be more efficient for a third party to receive the good. When $k > v(r) - \bar{v}(r)$ and $v(r) - \bar{v}(r) > c$, the buyer receives the good and resells it to the third party. Thus there is a chance that his reliance will have no return and the buyer takes this into account when he makes his reliance decision. Proposition 11 formally states this result.

Proposition 11:

The function e(r,p) achieves its supremum and it does so independently of p. Let E be the set of all values of r which maximize e. Then

$$\sup E \leq r_e \tag{39}$$

Proof:

See Appendix. □

H. Behavior under Restitution Damages -- Post-Contract Negotiations

The breach inefficiency in restitution damages is that when $k > c > v(r) - \bar{v}(r)$, the seller does not produce even though it is efficient to do so. Therefore, we would expect negotiations to determine a side payment from the buyer to the seller and the seller to produce in this case. The expected return to reliance for the buyer is then

$$e^*(r,p,\alpha) = \int_{\{\theta : c(\theta) \leq v(r) - \bar{v}(r)\}} \max\left\{ \begin{matrix} v(r) \\ k(\theta) - \bar{v}(r) \end{matrix} \right\} - r - p d\lambda$$

$$+ \int_{\{\theta : c(\theta) > v(r) - \bar{v}(r)\}} \Big\{ v(r) - r - p$$

$$+ \alpha \max\{0, k(\theta) - c(\theta)\} \Big\} d\lambda \tag{40}$$

This can be immediately rewritten as

$$e^*(r,p,\alpha) = e(r,p)$$

$$+ \alpha \int_{\{\theta : k(\theta) > c(\theta) > v(r) - \bar{v}(r)\}} k(\theta) - c(\theta) d\lambda. \tag{41}$$

When α is zero the buyer expects to receive no rents from negotiations and he views the situation as identical to one where no post-contract negotiations occur. As α grows the buyer has less incentive to over-rely in order to force the seller to honor more often. This is because the buyer expects to do fairly well even when the seller breaches. Not surprisingly, therefore, the buyer's reliance decision grows smaller and more efficient as the value of α increases. Proposition 12 formally states this result.

Proposition 12:

The function $e^*(r,p,\alpha)$ achieves its supremum over r for every p and α, and this is done independently of p. Let $E^*(\alpha)$ denote the set of values for r which maximize $e^*(r,p,\alpha)$. Let $\alpha_1 < \alpha_2$, $r_1 \in E^*(\alpha_1)$, and $r_2 \in E^*(\alpha_2)$. Then

(i) $E^*(0) = E$.

(ii) $\sup E^*(\alpha_2) \leq \sup E^*(\alpha_1)$ and $\inf E^*(\alpha_2) \leq \inf E^*(\alpha_1)$.

(iii) A larger value of α results in at least as efficient an outcome. That is, $f(r_1) \leq f(r_2)$.

(iv) E is upper hemi continuous.

Proof:

See Appendix. □

I Behavior under Ideal Restitution Damages

Under ideal restitution damages the breaching seller pays the buyer

$$\max\{k - p, v(r) - \bar{v}(r) - p\}. \qquad (42)$$

Ideal restitution damages thus protect the buyer's expectation under the assumption that the buyer would have sold to the third party if this was profitable. The buyer's return to reliance is thus

$$m(r,p) = \int_{\theta} \max\{k(\theta) + \bar{v}(r) - r - p, v(r) - r - p\} d\lambda. \qquad (43)$$

Figures 3 and 4 diagram the nature of the buyer's return to to reliance under both types of restitution damages.

FIGURE 3

BUYER'S RETURN TO RELIANCE UNDER
RESTITUTION DAMAGES -- POST-CONTRACT NEGOTIATIONS

θ is such that the largest of $\{v - \bar{v}, c, k\}$ is	Value to Buyer
$v - \bar{v}$	$v - r - p$
c	$\max\left\{\begin{matrix} v \\ k + \bar{v} \end{matrix}\right\} - r - p$
k, and $v - \bar{v} \geq c$	$k + \bar{v} - r - p$
and $c > v - \bar{v}$	$v - r - p + \alpha\,(k - c)$

FIGURE 4

BUYER'S RETURN TO RELIANCE UNDER
IDEAL RESTITUTION DAMAGES

θ is such that the largest of $\{v - \bar{v}, c, k\}$ is	Value to Buyer
$v - \bar{v}$	$v - r - p$
c	$\max\left\{\begin{matrix} v \\ k + \bar{v} \end{matrix}\right\} - r - p$
k	$k + \bar{v} - r - p$

The only difference between the two is the returns when $k > c > v - \bar{v}$. In this case, reliance is valuable to the buyer operating under restitution damages because it increases his return in the absence of cooperation and thus increases his negotiation strength. Under ideal restitution damages the buyer is already assigned the property right to third party sales and there is no incentive for the buyer to attempt to increase his negotiation strength. The extra marginal return in the former case means that reliance is higher.

Recall that under expectation damages the buyer receives a return to his reliance even when the seller sells to a thrid party. This is because the buyer's damage award, $v(r) - \bar{v}(r) - p$, is an increasing function of r. However, there is no joint return to the buyer's reliance when the seller sells to a third party; the reliance is simply sold for scrap. This divergence between the private and joint evaluation of the marginal return to reliance contributes to the buyer's over-investment in reliance relative to the level which maximizes joint profits. Imposition of ideal restitution damages amounts to a full correction of this divergence between the marginal private and joint return to reliance. Under ideal restitution damages the buyer's damages depend on the price paid by the third party, $k(\theta)$, instead of $v(r)$. Since k does not depend on r, the buyer's marginal return to reliance now equals the marginal joint return. Therefore it is not surprising that ideal restitution damages result in a smaller and more efficient level of reliance than expectation damages. It is easy to see that ordinary restitution damages produce a partial correction for this divergence and that the correction increases with α. Therefore ordinary restitution damages produce reliance decisions midway between the other two, with the decision becoming closer to that of ideal restitution damages as α grows larger.

Recall that under expectation damages there is also a second contributor to an overly large reliance decision. In the case where cost rises dictate that the seller not produce at all, the buyer still receives a return to his reliance from the damage award. However, there is no joint return to reliance in this case. This distortion persists under ideal restitution damages, as is clear from Figure 4. Therefore, even ideal restitution damages produce a reliance decision larger than that which maximizes joint profits. Although it removes the distortion associated with third party offers, it does not affect the distortion associated with cost increases. This suggests, and it is in fact easy to show, that in a world where third party offers do not occur, ideal restitution, restitution and expectation damages are equivalent. The next two

sections will show that specific performance begins where restitution damages leave off. Specific performance always produces a full correction of the third party offer distortion, and as α grows it also corrects progressively for the cost rise distortion so that when α equals 1, specific performance produces an efficient reliance decision. Proposition 13 summarizes ideal restitution damages' properties.

<u>Proposition 13</u>:

The function $m(r,p)$ achieves its supremum independently of p. Let M be the values of r such that m achieves its supremum. Then

$$\inf R \leq \inf M \text{ and } \sup R \leq \sup M \tag{44}$$

$$\sup M \leq \sup E^*(1) \text{ and } \inf M \leq \inf E^*(1) \tag{45}$$

<u>Proof</u>:

See Appendix. □

J. <u>Specific Performance -- No Post-Contract Negotiations</u>

The damage remedy producing the most efficient reliance decision thus far, ideal restitution damages, is probably not implementable due to the court's inability to determine the value of k in the absence of a transaction occurring. Fortunately, specific performance will be seen to produce the identical incentives relating to the buyer's reliance decision as ideal restitution damages. In the next section it will be seen that specific performance induces an even more efficient reliance decision to the extent that the buyer believes he will capture rents from post-contract negotiations.

The buyer now always receives the good. His expected return to reliance is thus

$$s(r,p) = \int_{v(r) - \overline{v}(r) \geq k(\theta)} v(r) - r - p d\lambda + \int_{v(r) - \overline{v}(r) < k(\theta)} k(\theta) + \overline{v}(r) - r - p d\lambda \quad (45)$$

Since he always receives the good his return is simply the maximum of the return he can receive by using it himself or selling to the third party. This is exactly what the seller receives under ideal restitution damages. That is, $s(r,p) = m(r,p)$. Therefore reliance choice under both institutions is the same. Let S be the maximizing choices of $s(r,p)$. We have proven

Proposition 14:

$$S = M .$$

Proof:

As above. □

K. Specific Performance -- Post-Contract Negotiations

The inefficiency given reliance of specific performance is that the good is always produced, even when cost rises dictate that

joint profits would be maximized by no production. Post-contract negotiations might be expected to resolve such a situation. The seller could offer the buyer a side payment in lieu of performance which would render them both better off. As usual, the buyer's expectations of the size of this side payment affect his expected return to reliance and thus his reliance decision. Once again α is the fraction of the increased joint profits that the buyer expects to receive. Figure 5 diagrams the buyer's expected return to reliance.

FIGURE 5

BUYER'S RETURN TO RELIANCE UNDER SPECIFIC PERFORMANCE -- POST-CONTRACT NEGOTIATIONS

θ is such that the largest of $\{v - \overline{v}, c, k\}$ is	Value to Buyer
$v - \overline{v}$	$\max\{v - \overline{v}, k\} - r - p$
k	$\max\{v - \overline{v}, k\} - r - p$
c	$(1 - \alpha)[\max\{v - \overline{v}, k\} - r - p]$ $+ \alpha[c + \overline{v} - r - p]$

As α grows larger, the buyer's returns when costs increases make production unprofitable begin to depend more on the rents he can negotiate from the seller in exchange for allowing him out of the contract. Mathematically, this means that his returns in this case begin to depend less and less on his own reliance choice and more on the size of the seller's cost over-run. From Figure 1 it is is clear that this is also the case for the joint return to reliance. In fact, when α equals 1, it is clear from comparing the two figures that the returns only differ by a constant, $p - c(\theta)$. Therefore the same choices of r maximize the aggregate return as the buyer's return under specific performance when α equals 1. That is, the buyer's choice of reliance maximizes joint profits in this case.

As explained in Section I, expectation damages produces an over-investment in reliance because the buyer receives a return to his reliance when it is efficient for a third party to receive the good or for the good not to be produced at all even though the buyer's reliance is not used in these cases and therefore does not increase joint profits. Therefore, ex ante, the buyer over-values reliance and over-invests in it.

Ideal restitution damages and specific performance when α is zero amount to a complete correction of the divergence between the private and joint returns to reliance for the case where the efficient course of action is for the third party to receive the good. As α grows larger, specific performance progressively corrects for the other distortion as well, so that when α equals 1, specific performance produces a perfectly efficient reliance decision. The buyer makes a more efficient decision as α grows because he expects to receive more and more of the gains from an efficient decision on his part.

The buyer's return to reliance in this case is

$$s^*(r,p,\alpha) = \int_{P_1^*(r)} v(r) - r - p d\lambda + \int_{P_2^*(r)} k(\theta) + \bar{v}(r) - r - p d\lambda$$

$$+ \int_{P_3^*(r)} \left\{\bar{v}(r) - r - p + \alpha c(\theta) + (1 - \alpha) \max\{k(\theta), v(r) - \bar{v}(r)\}\right\} d\lambda. \quad (46)$$

Proposition 15 summarizes the properties of s^*.

Proposition 15:

The function $s^*(\cdot,p,\alpha)$ achieves its supremum independently of p. Let $S^*(\alpha)$ denote the set of values which maximize $s^*(\cdot,p,\alpha)$. Let $\alpha_1 < \alpha_2$. Then

(i) $S^*(0) = S$.

(ii) $S^*(1) = R$.

(iii) $\inf S^*(\alpha_2) \leq \inf S^*(\alpha_1)$ and $\sup S^*(\alpha_2) \leq \sup S^*(\alpha_1)$.

(iv) Higher values of α produce more efficient outcomes. That is, if $r_i \in S^*(\alpha_i)$, then $f(r_2) \geq f(r_1)$.

(v) S^* is upper hemi continuous.

Proof:

See Appendix. □

L. Liquidated Damages

The optimality of specific performance depends on post-contract negotiations successfully occurring and for the buyer to believe he will be successful in capturing most of the rents up for negotiation. Furthermore, we have not considered the transactions costs of these negotiations or the effects of the ex ante increase in risk created by relying on the outcome of post-contract negotiations. For these reasons it may well be that damage institutions not relying on post-contract negotiations are generally superior to those that do. It is easy, for example, to create examples where agents averse to the risk of post-contract negotiations prefer expectation damages to specific performance.

Proposition 16:

Agents averse to the risk of negotiations may prefer expectation damages to specific performance.

Proof:

See Appendix. □

Fortunately, a damage measure does exist which induces efficient reliance on the part of the buyer but does not require post-contract negotiations. The buyer and seller can insert a value of lump-sum damages to be paid by the seller to the buyer in the event of breach which results in an efficient reliance choice by the buyer and an efficient breach decision by the seller.

Proposition 17:

Let r^* be any element of R. Then a liquidated damages award of $v(r^*) - \overline{v}(r^*) - p$ induces a reliance choice in R for the buyer and an efficient breach choice for the seller.

Proof:

See Appendix. □

The intuition is clear. Expectation damages, $v(r) - \overline{v}(r) - p$, produce efficient breach behavior at r. As long as the buyer chooses r^*, the seller thus exhibits efficient breach behavior. The buyer now chooses an efficient level of reliance because the damages he receives in the event of breach do not depend on his own level of reliance.

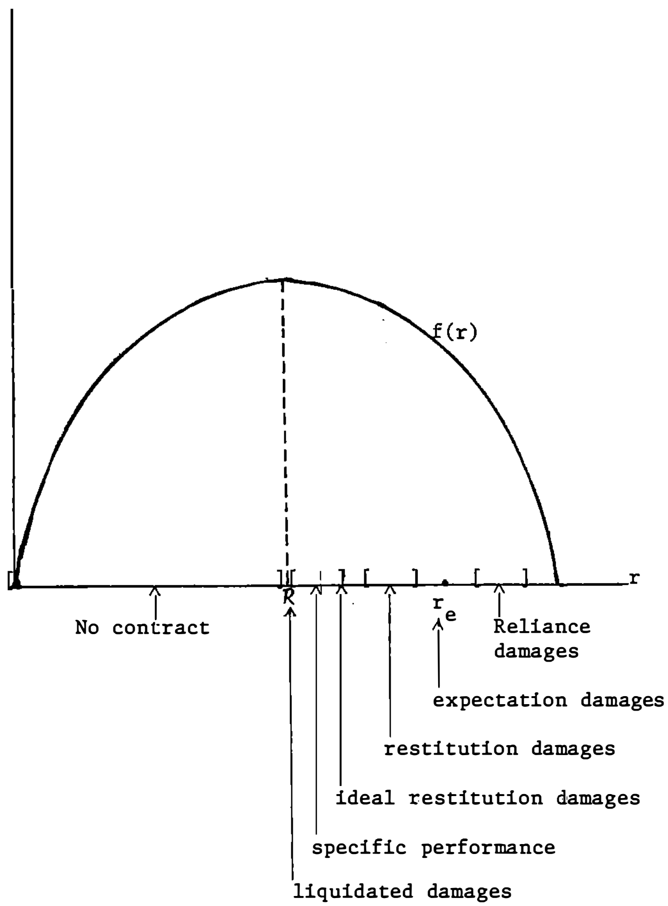
Since the buyer and seller can maximize their *ex ante* joint return by choosing liquidated damages of $v(r^*) - \overline{v}(r^*) - p$, presumably they would do so. This raises the question of why all contracts do not incorporate liquidated damages. First, the amount of reliance at stake may not always be large enough to be significant. Second, courts do not always enforce liquidated damages clauses (Goetz and Scott, 1977). Third, and possibly most important, however, v may be random. That is, v may be a function of θ as well. In this case, it is easy to prove that liquidated damages of $v(r^*,\theta) - \overline{v}(r^*,\theta) - p$ induce efficient behavior, but now contracts must specify an entire function instead of one number. Furthermore, various moral hazard problems are raised if θ is not observable. Therefore, as v becomes more variable, liquidated damages becomes a less satisfactory damage measure. This theory predicts that in cases where the cost of inefficient reliance is significant and v is not too variable, liquidated damages would be used.

M. Summary

Figure 6 provides a graphical summary of the results of the case where no market for substitute performance exists.

FIGURE 6

SUMMARY -- NO MARKET FOR SUBSTITUTE PERFORMANCE



Four points should be noted. First, the intervals for some damage measures occur because post-contract negotiations occur to resolve inefficient breach behavior at the given level of reliance. Each point in the interval corresponds to the buyer's reliance choice under a different value for his subjective negotiation strength, α. For no contract, specific performance, and restitution damages, the reliance choice moves towards R and becomes more efficient as α grows. Second, because the intervals are all disjoint, we get an unambiguous ranking of the institutions even if a different value for α is used for different institutions. Third, some of the endpoints of intervals may be shared and some intervals may collapse in degenerate situations. For example, when there are no third party offers the entire restitution damages interval collapses into r_e. Fourth, f is drawn as concave in Figure 6. In fact, f is not necessarily concave. The original work in this area (Shavell 1978) assumed that v was concave and then asserted this implied f was also concave. This assertion was false. All the results we would expect were f concave are instead proven on the basis of dividing the objective functions into non-decreasing and non-increasing parts. See Lemmas 3, 4, and 5 in particular. Since all the theorems that would be true were f concave are true, it is convenient to draw f as being concave.

V. OTHER CONSIDERATIONS

A number of factors were not considered which may affect the nature of the conclusions. The purpose of this section is to take note of some of these and speculate on their effects, suggesting directions for future research.

First, the different damage measures allocate risk differently. For example, restitution damages places the risk of third party offers on the buyer; expectation damages places this risk on the seller. Differential attitudes towards risk might therefore affect choice of a damage measure.

Second, the buyer and seller may possess different subjective evaluations of the likelihood of various outcomes of θ. Therefore, for example, the agent who thought a particular risk had less variance might be more willing to bear it. An important example concerns the case where the buyer has very little knowledge of θ at all, but the seller has good information on θ and knows he will in all likelihood honor the contract. To the seller there is little cost in agreeing to specific performance; to the buyer there is a large benefit, especially if the buyer would have to incur search costs in the event of breach. (Search costs are typically not included in expectation damages.) In some sense, by agreeing to specific performance the seller is communicating to the buyer that breach is unlikely.

Third, it was assumed that both parties could equally well resell the good to the third party. It may well be, however, that the seller has an advantage in selling to third parties because of fixed costs such as a showroom, repair services, reputation, etc. Therefore damage measures which transfer the property right to third party sales to the buyer (specific performance, ideal restitution damages, and restitution damages) might well involve a post-contract negotiation

transferring this property right back to the seller in the event of a large third party offer. Post-contract negotiations result in extra risk and transactions costs.

Fourth, search may be required to ferret out third party offers. If, as seems likely, the seller is the efficient searcher, transfer of the property right to third party sales to the buyer would result in too little search occurring.

This transfer of the property right to third party offers has been taken note of in the literature on specific performance (Kronman 1978; Schwartz 1979). Kronman attempted to argue that specific performance would be typically more desired for unique goods on the basis of the first point above. Schwartz pointed out that Kronman's speculations were not correct. It is true that specific performance is equivalent to expectation damages when a market for substitute performance exists, and is thus not necessary. Within the class of goods for which no market for substitute performance exists, the second point above suggests a type of good for which specific performance might be desirable. However, the third and fourth points above suggest types of goods for which specific performance would be undesirable. Therefore, although the absence of a market for substitute performance is necessary for specific performance to be useful, it is by no means sufficient.

Fifth, when damage measures produce inefficient breach behavior at the given reliance level and depend on post-contract negotiations to resolve this, transactions costs or aversion to the risk of negotiations may produce an advantage for damage measures which do induce efficient breach behavior. See Proposition 16 and the discussion surrounding it.

A sixth, related point is that the choice of an efficient level of reliance requires knowledge of k(θ) and c(θ). The damage measures which outperform expectation damages require the buyer to possess progressively more information as the reliance decision becomes progressively more efficient. For example, under restitution damages the buyer must know k(θ) to calculate his optimal level of reliance; under specific performance he must know k(θ) and c(θ). Therefore an implicit assumption in the conclusion that various measures outperform expectation damages is that the buyer has the information to make an optimal reliance choice. In a situation where the buyer has no knowledge of c(θ) or k(θ), the institution of expectation damages which requires that the buyer only know his own private information, v(r), may produce the same reliance decision as institutions which outperform it under conditions of fuller information. Points five and six may help explain the prevalent use of expectation damages in the courts. The buyer often may not possess sufficient information for other institutions to produce a better reliance decision than expectation damages and expectation damages results in no post-contract negotiations.

Seventh, much less litigation may be involved in enforcing some damage measures than others. When the good or service contracted for is difficult to monitor, specific performance may be very expensive to enforce. Often, expensive litigation will be required to determine the value of the award under expectation damages.

Possibly liquidated damages involves the smaller enforcement cost in the case where they do not depend on difficult to measure factors (i.e., where v is not a function of a difficult to monitor θ).

Eighth, the courts often have difficulty in awarding "idiosyncratic" expectation damages. Even though a particular good or service may be worth well above the average value of such goods or services to a particular breachee, it is difficult to establish this and consequently expectation damages do not protect this "idiosyncratic" value. Liquidated damages or specific performance can do this. This point has been made persuasively in the literature (Goetz and Scott 1977).

VI. CONCLUSION

When a market for substitute performance exists, most of the problems considered in this paper vanish. The relier needs no assurances of performance to rely efficiently. The institutions of expectation damages and specific performance produce no moral hazard and result in efficient allocation of resources. That is, society finds itself in the unfortunate position that the existence of a problem for the institution of contracts to solve is also sufficient to cause contracts to create their own inefficiency. This paper is an analysis of the capabilities of various contract institutions for coping with such a perverse market failure.

The absence of a competitive market means that a party who engages in reliance in anticipation of a future exchange worsens his negotiating position in the future negotiation over price of exchange. This results in less than efficient levels of reliance. Contracts "solve" this problem, but only at the cost of providing that the relier receive some private return from reliance even in cases where some exogenous happening renders exchange inefficient and the reliance has no social return. As with many other types of insurance, a moral hazard is created. In this case the relier tends to over-rely.

Reliance damages result in the least efficient allocation of goods regardless of whether or not post-contract negotiations occur and regardless of the level of confidence the relier has concerning this negotiating strength. Restitution damages tend to produce a more efficient reliance choice than expectation damages because under the former the relier takes into account the fact that sales to a third party may make his reliance useless. Assuming that post-contract negotiations occur, specific performance is even more efficient. If the relier has absolutely no confidence in his negotiating strength, his reliance choice is largest. As his confidence grows he takes more and more account of the fact that rises in cost of production may render performance inefficient and thus he relies more efficiently. In the limit, as he expects to receive all the rent from any negotiaiton, his reliance decision is efficient. The buyer and seller can choose a level of liquidated damages, which induces efficient behavior.

The formal analysis of this paper highlights the crucial role of information in the process of contracting. Essentially, it seems that although other institutions may produce more efficient behavior than expectation damages, the institution currently being

used, they require more information and/or negotiations. Under conditions of poor information, agents averse to the variance generated by poor information might well find that expectation damages are the most efficient contract institution.

Current law frowns upon specific performance and liquidated damages clauses, often not enforcing such agreements (Schwartz 1979; Goetz and Scott 1977). The economists' simple-minded statement that freedom of choice can only always make everyone better off is not sufficient to sway the courts. They claim that the opportunity to insert such clauses in contracts often allows more exercise of monopoly power and other unfair bargaining power. This may well be and is worthy of analysis in itself. Another line of counterargument is to identify specific reasons why parties to a contract might find it to their mutual advantage to insert such clauses into their contracts. This tactic has been followed by previous authors (Kronman 1978; Schwartz 1979; Goetz and Scott 1977). This paper adds another reason why parties to a contract may prefer specific performance or liquidated damages over more conventional remedies.

APPENDIX

To prove Proposition 2, it is easiest to first establish two simple lemmas.

<u>Lemma 1</u>:

Let S be a set. Let h_i be a real valued function defined on R x S for i = 1,...,n. Define h: R x S → R by

$$h(x,s) = \max_{i \in \{1,\ldots,n\}} \{h_i(x,s)\}. \tag{A-1}$$

Suppose each h_i is continuous in its first variable uniformly over its second variable. That is, for every $i \in \{1,\ldots,n\}$, $x_o \in R$ and $\varepsilon > 0$ there exists a $\delta > 0$ such that for every $s \in S$ and $x \in R$

$$|x - x_o| < \delta \Rightarrow |h_i(x,s) - h_i(x_o,s)| < \varepsilon. \tag{A-2}$$

Then h is also continuous in its first variable uniformly over its second variable.

<u>Proof</u>:

Choose any $x_o \in R$ and $\varepsilon > 0$. Then there exists a $\delta > 0$ such that for every $i \in \{1,\ldots,n\}$, $s \in S$ and $x \in R$

$$|x - x_o| < \delta \Rightarrow |h_i(x,s) - h_i(x_o,s)| < \varepsilon. \tag{A-3}$$

Now let i*(x) and i** be the elements of {1,...,n} which, respectively,

maximize $h_i(x,s)$ and $h_i(x_o,s)$. Then

$$|h(x,s) - h(x_o,s)| = |h_{i*(x)}(x,s) - h_{i**}(x_o s)| \tag{A-4}$$

First suppose that $h_{i*(x)}(x,s) - h_{i**}(x_o,s) \geq 0$. Then it is less than or equal to $h_{i*(x)}(x,s) - h_{i*(x)}(x_o,s)$ which is less than ε by (A-3). Second, suppose that $h_{i*(x)}(x,s) - h_{i**}(x_o,s) < 0$. Then it is less than or equal to $h_{i**}(x,s) - h_{i**}(x_o,s)$ in absolute value which is less than ε in absolute value by (A-3). □

<u>Lemma 2</u>:

Let S be a measurable bounded subset of R^n. Let h be a real valued function defined over R x S which is continuous in its first variable uniformly over its second variable and measurable in its second variable. Define g:R → R by

$$g(x) = \int_S h(x,s)ds. \tag{A-5}$$

Then g is continuous.

<u>Proof</u>:

Choose any $x_o \in R$ and $\varepsilon > 0$. Then select a δ such that

$$|x - x_o| < \delta \Rightarrow |h(x,s) - h(x_o,s)| < \frac{\varepsilon}{\lambda(S)}. \tag{A-6}$$

Then

$$|g(x) - g(x_o)| \leq \int_S \frac{\varepsilon}{\lambda(S)} d\lambda = \varepsilon. \quad \text{(A-7)}$$

□

Proposition 2

It is clear that f can be rewritten as

$$f(r) = \int_{[0,1]^2} \max \left\{ \begin{array}{l} v(r) - r - c(\theta) \\ \bar{v}(r) - r + k(\theta) - c(\theta) \\ v(r) - r - k(\theta) \\ \bar{v}(r) - r \end{array} \right\} d\lambda. \quad \text{(A-8)}$$

Each of the four functions in brackets is continuous in r uniformly over θ. Therefore by Lemma 1, so is their maximum. Therefore by Lemma 2 f is continuous.

The function $\bar{v}(r) - r$ is always decreasing in r. Therefore, for $r > r_e$ all four functions are larger at r_e than r. Therefore so is f. Therefore f achieves its supremum on $[0,r_e]$. □

Proposition 3

It is clear that the buyer and seller act so that $P_i = P_i^*(r)$ for i = 1,2,3,4. Therefore the buyer's expected return as a function of r is

$$b(r) = \int_{P_1^*(r) \cup P_3^*(r)} v(r) - r - k(\theta) d\lambda + \int_{P_2^*(r) \cup P_4^*(r)} \bar{v}(r) - r d\lambda. \quad \text{(A-9)}$$

Now rewrite b(r) as

$$b(r) = f(r) + \int_{P_1^*(r) \cup P_2^*(r)} c(\theta) - k(\theta) d\lambda. \quad \text{(A-10)}$$

However, $P_1^*(r) \cup P_2^*(r)$ equals

$$\{(\theta): c(\theta) \leq k(\theta)\} \quad \text{(A-11)}$$

which does not depend on r. Therefore b(r) and f(r) differ only by a constant, and they have the same maximizing values. □

Proposition 4

It is clear that the buyer and seller will act so that $P_i = P_i^*(r)$ for i = 1,2,3,4. Therefore the buyer's expected return as a function of r and p, the contract price, is

$$e(r,p) = \int_{P_1^*(r) \cup P_3^*(r)} v(r) - r - p d\lambda + \int_{P_2^*(r) \cup P_4^*(r)} \bar{v}(r) - r + k(\theta) - p d\lambda. \quad \text{(A-12)}$$

Now rewrite e(r,p) as

$$e(r,p) = f(r) + \int_{P_1^*(r) \cup P_2^*(r)} c(\theta) - p d\lambda + \int_{P_3^*(r) \cup P_4^*(r)} k(\theta) - p d\lambda. \quad \text{(A-13)}$$

However, as in Proposition 3, $P_1^*(r) \cup P_2^*(r)$ does not vary with r. Neither does $P_3^*(r) \cup P_4^*(r)$. Therefore e(r,p) differs from f(r) by a constant. □

Lemma 3 is used to prove Proposition 7.

Lemma 3:

Let h and g be real valued functions defined on R. Let g be decreasing. Choose α_1 and α_2 in (0,1]. Let $\alpha_1 > \alpha_2$. Suppose that r_i maximizes

$$h(r) + \frac{(1 - \alpha_i)}{\alpha_i} g(r) \quad \text{(A-14)}$$

for i = 1,2. Then $r_1 \geq r_2$. Furthermore, if $\alpha_i \neq 1$, then $r < r_i$ implies that $h(r) < h(r_i)$.

Proof:

Suppose that $r_2 > r_1$. Then $g(r_2) < g(r_1)$. As well $\frac{(1 - \alpha_1)}{\alpha_1} < \frac{(1 - \alpha_2)}{\alpha_2}$. Therefore we have

$$\left[\frac{(1 - \alpha_2)}{\alpha_2} - \frac{(1 - \alpha_1)}{\alpha_1}\right] g(r_2) < \left[\frac{(1 - \alpha_2)}{\alpha_2} - \frac{(1 - \alpha_1)}{\alpha_1}\right] g(r_1) \quad \text{(A-15)}$$

As well since r_1 is a maximizing value of (A-14) for α_1,

$$h(r_2) + \frac{(1 - \alpha_1)}{\alpha_1} g(r_2) \leq h(r_1) + \frac{(1 - \alpha_1)}{\alpha_1} g(r_1) \quad \text{(A-16)}$$

Add (A-15) and (A-16) to yield

$$h(r_2) + \frac{(1 - \alpha_2)}{\alpha_2} g(r_2) < h(r_1) + \frac{(1 - \alpha_2)}{\alpha_2} g(r_1) \quad \text{(A-17)}$$

which contradicts the definition of r_2.

Therefore r_2 must be less than or equal to r_1.

For the last part, if $r < r_i$, then the fact that g is decreasing implies $h(r) < h(r_i)$. □

Proposition 7

Rewrite $b(r,\alpha)$ as

$$b(r,\alpha) = \alpha\left(f(r) + \int_{\{\theta\ :\ c < k\}} c(\theta) - k(\theta)d\lambda\right) + (1 - \alpha)(\bar{v}(r) - r) \quad \text{(A-18)}$$

by performing the required algebra. If $\alpha = 0$, $N(\alpha)$ clearly equals {0}. Therefore for any $\alpha \neq 0$, $\sup N(0) \leq \inf N(\alpha)$. Now consider the case where $\alpha \neq 0$. Rewrite b as

$$b(r,\alpha) = \alpha\left[f(r) + \frac{(1 - \alpha)}{\alpha}(\bar{v}(r) - r) + \int_{\{\theta\ :\ c < k\}} c(\theta) - k(\theta)d\lambda\right] \quad \text{(A-19)}$$

Since $r > r_e$ implies $f(r) < f(r_e)$, $\bar{v}(r) - r$ is decreasing, and since both $f(r)$ and $\bar{v}(r) - r$ are continuous, $b(r,\alpha)$ achieves its supremum Lemma 3 now yields results (iii) and (iv). Result (v) follows directly from a theorem in Debreau (1959), page 1.9. □

Proposition 8

Rewrite equation (34) as

$$a(r,p) = (v(r) - r - p)\ \lambda(H(r,p)). \quad \text{(A-20)}$$

For $r < r_e$, $v(r) - r - p < v(r_e) - r_e - p$. As well, $\lambda \cdot H(\cdot,p)$ is nondecreasing in r. Therefore, all of the global maxima to $a(\cdot,p)$ occur in $[r_e,\infty)$.

For part (ii) it is sufficient to show that $\lambda \cdot H$ is upper semicontinuous in r. This is true because $\lambda \cdot H(r,p)$ is actually $F(p - v(r) + r, p - v(r) + r)$ where F is the distribution function of the random variables c and k. The function F is by definition nondecreasing and continuous from the right so is upper semicontinuous. □

Proposition 10

Rewrite $a^*(r,p,\alpha)$ as follows

$$a^*(r,p,\alpha) = \alpha \int_{P_1^*(r)} v(r) - \max\begin{Bmatrix} r + p \\ k(\theta) + \bar{v}(r) \\ c(\theta) + \bar{v}(r) \end{Bmatrix} d\lambda$$

$$+ (1 - \alpha) \int_{H(r,p)} v(r) - r - p d\lambda. \quad \text{(A-21)}$$

As for Proposition 8, both integrals are larger at r_e than at any $r < r_e$. Therefore this is also true for any convex combination of the two integrals. Consequently $a^*(\cdot,p,\alpha)$ is maximized on $[r_e,\infty)$ if at all.

For existence, the second integral is an upper semicontinuous function of r as proved in Proposition 8. The first integral can be rewritten as

$$\int_{[0,1]} \max\begin{Bmatrix} v(r) \\ k(\theta) - \bar{v}(r) \\ c(\theta) + \bar{v}(r) \end{Bmatrix} - \max\begin{Bmatrix} r + p \\ k(\theta) + \bar{v}(r) \\ c(\theta) + \bar{v}(r) \end{Bmatrix} d\lambda. \quad \text{(A-22)}$$

Now in much the same fashion as for Proposition 2, it can be shown that (A-22) is a contiuous functions of 4. Therefore a* is an upper semicontinuous function of r for every (p,α). If $v(r) - r - p$ is eventually negative for large enough r, it is clear that $a^*(r,p,\alpha)$ will also be negative for large enough r. As a consequence, it must achieve its supremum somewhere. □

Proposition 11

Expression (39) is proven in the same fashion as the previous proofs, by dividing e into the function whose supremum occurs at tye bound and a function which is nondecreasing. Once (39) is proven, for existence it is sufficient to show that e is upper semicontinuous. This is done by the same type of argument as in Propositions 2 and 8. □

Lemma 4:

Let h and g be real valued functions defined on $\mathcal{R}$. Let g be nonincreasing. Choose α_1 and α_2 in [0,1] with $\alpha_1 < \alpha_2$. Suppose that $\mathcal{R}_i$ is the set of values for r which maximize

$$h(r) + \alpha_i g(r). \quad \text{(A-23)}$$

Let $r_i \in R_i$. Then

(i) $\sup R_2 \leq \sup R_1$

(ii) $\inf R_2 \leq \inf R_1$

(iii) $r < r_i$ implies $h(r) \leq h(r_i)$.

<u>Proof</u>:

(i) Suppose that there exists an $r_2 \in R_2$ such that $r_2 > \sup R_1$. Then consider any $r_1 \in R_1$. We know that

$$h(r_1) + \alpha_1 g(r_1) > h(r_2) + \alpha_1 g(r_2) \tag{A-24}$$

because $r_2 > \sup R_1$.

As well,

$$(\alpha_2 - \alpha_1)g(r_1) \geq (\alpha_2 - \alpha_1)g(r_2) \tag{A-25}$$

because g is in increasing and $r_2 > \sup R_1$. Adding (A-24) and (A-25) yields

$$h(r_1) + \alpha_2 g(r_1) > h(r_2) + \alpha_2 g(r_2), \tag{A-26}$$

contradicting the definition of r_2. Therefore, for every $r_2 \in R_2$, $r_2 \leq \sup R_1$, or equivalently, $\sup R_2 \leq \sup R_1$.

(ii) This is proven in a similar fashion to (i).

(iii) The fact that g is non increasing means

$$-\alpha_i g(r) \leq - \alpha_i g(r_i). \tag{A-27}$$

Also, since $r_i \in R_i$,

$$h(r) + \alpha_i g(r) \leq h(r_i) \_ \alpha_i g(r_i). \tag{A-28}$$

Addition of (A-27) and (A-28) yields

$$h(r) \leq h(r_i). \tag{A-29}$$

□

<u>Proposition 12</u>:

Part (i) is obvious. Parts (ii) and (iii) follow immediately from Lemma 4. Existence of a maximum follows as usual from upper semicontinuity.

□

<u>Proposition 13</u>:

Rewrite (43) as

$$m(r,p) = e*(r,1) + \int_{\{\theta \,:\, k > c > v - \bar{v}\}} \{c(\theta) - (v(r) - \bar{v}(r))\} d\lambda \tag{A-30}$$

The above integrand is decreasing in r and non-negative. The region being integrated over shrinks as r increases. Therefore the integral in (A-30) is a non increasing function of r. From this, (45) is clear.

Now rewrite (43) as

$$m(r,p) = f(r) + c(\theta) - p + \int_{\{\theta \,:\, c(\theta) > k(\theta) \wedge c(\theta) > v(r) - \bar{v}(r)\}} \{\max(k(\theta), v(r) - \bar{v}(r)) - c(\theta)\} d\lambda \tag{A-31}$$

The integrand is negative and increases in r. The domain of integration decreases with r. Therefore, the integral is a non-decreasing function of r. This proves (44).

Existence and upper hemi-continuity is proved by the usual upper semicontinuity argument as in Proposition 7. □

<u>Lemma 5</u>:

Let h and g be real valued functions defined on $\mathcal{R}$. Let g be non decreasing. Choose α_1 and α_2 in [0,1] with $\alpha_1 < \alpha_2$. Suppose that R_i is the set of values for r which maximize

$$h(r) + \alpha_i g(r). \tag{A-32}$$

Let $r_i \in R_i$. Then

(i) $\inf R_1 \leq \inf R_2$

(ii) $\sup R_1 \leq \sup R_2$

(iii) $r > r_i$ implies $h(r) \leq h(r_i)$.

<u>Proof</u>:

The proof is substantially the same as that of Lemma 4. □

<u>Proposition 15</u>:

First rewrite $s^*(r,p,\alpha)$ as

$$s^*(r,p,\alpha) = v(r) - r - p + \int_{P_2^*(r)} \bar{v}(r) - v(r) + k(\theta)d\lambda$$

$$+ \int_{P_3^*(r)} \bar{v}(r) - v(r) + c(\theta) + (1-\alpha)\max\{k(\theta), v(r) - \bar{v}(r)\}d\lambda. \tag{A-33}$$

It is easy to see that both integrals are non-increasing functions of r. Therefore if s* achieves its supremum, it does so on $[0,r_e]$. The

usual proof of upper semicontinuity thus establishes existence and upper hemi-continuity of S^*.

Now rewrite $s^*(r,p,\alpha)$ as

$$s^*(r,p,\alpha) = f(r) + \int_{[0,1]} c(\theta) - p d\lambda$$

$$+ (1-\alpha)\int_{P_3^*(r)} \max\{k(\theta), v(r) - \bar{v}(r)\} - c(\theta)\, d\lambda. \tag{A-34}$$

It is easy to see that the second integral is a non-decreasing function of r. □

<u>Proposition 16</u>:

The proof of this proposition is a counterexample. Suppose that the buyer is averse to the risks of negotiations. Model this by assuming that although the buyer believes the expected value of his negotiating strength is such that α is α^*, he uses $\alpha = \alpha_b$ where α_b is less than α^* to evaluate the desirability of any such gamble. This is a type of certainty equivalence. In the limit the buyer may have no basis at all for forming an expected value. He might then exhibit maxi-min behavior, attempting to guarantee himself some minimum level of income even in the worst case. For the buyer this means choosing $\alpha_b = 0$. To the extent that the buyer is averse to risks associated with the negotiation process, he will choose α_b less than α^*, the true value of α.

I assume that the seller is risk neutral and that there are no third party offers. More general counterexamples can, of course, be created, but since this is essentially a counterexample to the previous results, I select the simplest case.

This example shows that if the buyer is risk averse enough, expectation damages are actually more efficient than specific performance. The intuition behind this result is straight-forward. As the buyer becomes more risk averse, his reliance choice under specific performance becomes less and less superior to the reliance choice under expectation damages. That is, the advantage to specific performance declines. This fact alone would cause specific performance to be equally efficient to expectation damages in the limit. However, another factor is also at work, besides the reliance choice becoming less efficient. As well, the buyer begins to discount the expected return from negotiations. At some point these factors invariably combine to produce a larger efficiency gain for expectation damages. The formal statement is as follows.

Formal Statement of Counterexample:

Suppose that the buyer compares returns from specific performance to those from expectation damages by using $\alpha = \alpha_b$. Let the actual value of α be α^*. Suppose that there is a positive probability of cost overruns. That is,

$$\int_{P_3^*(r_e)} c(\theta)d\lambda > 0.$$

Then

(i) For every $\alpha^* > 0$ there exists an $\alpha_b^* > 0$ such that

$\alpha_b < \alpha_b^*$ implies that expectation damages are more efficient than specific performance.

(ii) If $\alpha^* = 0$, then $\alpha_b = 0$ implies that expectation damages and specific performance are equally efficient.

Proof:

The seller evaluates the two returns by comparing their expected values. The buyer evaluates the two returns by comparing the certain return from expectation damages to the discounted expected return from specific performance. It is clear in this case that one institution is more efficient than the other if and only if the sum of the buyer's and seller's evaluations is greater. (A side payment is always possible such that the institution producing the greatest aggregate value will result in both parties being better off than under the second institution.) Therefore it is sufficient to show that the sum of evaluations from expectation damages is less than that from specific performance. The former number is $f(r_e)$. The latter is

$$S^*(r_s,p,\alpha_b) + f(r_s) - S^*(r_s,p,\alpha^*) \qquad \text{(A-35)}$$

where r_s is the element of $S^*(\alpha_b)$ chosen by the buyer. Let $G(\alpha_b)$ be the set of all possible values for (A-35).

$$G(\alpha_b) = \{S^*(r_s,p,\alpha_b) + f(r_s) - S^*(r_s,p,\alpha^*) : r_s \in S^*(\alpha_b)\}. \qquad \text{(A-36)}$$

Let $g(\alpha_b)$ be the supremum of $G(\alpha_b)$.

$$g(\alpha_b) = \sup G(\alpha_b). \qquad \text{(A-37)}$$

It is easy to observe that g(0) equals $f(r_e)$ when $\alpha^* = 0$ and is less than $f(r_e)$ when $\alpha^* > 0$. Therefore (ii) is proven. To prove (i) we must show that g is upper semicontinuous. This follows from a theorem in Debreu (Debreu 1959), page 1.9. □

Proposition 17:

First consider the seller. The seller receives $p - c(\theta)$ if he performs, $k(\theta) - c(\theta) - v(r^*) + \bar{v}(r^*) + p$ if he sells to a third party, and $-v(r^*) + \bar{v}(r^*) + p$ if he breaches. The seller's breach decision is therefore as follows:

θ is such that the largest of $\{v(r^*) - \bar{v}(r^*), k(\theta), c(\theta)\}$ is	The seller
$v(r^*) - \bar{v}(r^*)$	honors contract
$k(\theta)$	sells to third party
$c(\theta)$	does not produce

Now consider the buyer. Let d be the damages. Then the buyer's return to reliance is

$$\ell(r,p) = \int_{P_1^*(r^*)} v(r) - r - p \, d\lambda + \int_{P_2^*(r^*) \cup P_3^*(r^*)} d + \bar{v}(r) - r \, d\lambda. \qquad \text{(A-38)}$$

Rewrite this as

$$\ell(r,p) = F(r, P_1^*(r^*), P_2^*(r^*), P_3^*(r^*)) + \int_{P_1^*(r^*)} c(\theta) - p d\lambda + \int_{P_2^*(r^*)} d + c(\theta) - k(\theta) d\lambda + \int_{P_3^*(r^*)} d \, d\lambda. \qquad \text{(A-39)}$$

None of the integrals are functions of r. Therefore ℓ and F differ only by a constant and are maximized by the same values of r. To see that ℓ and F are maximized at r, suppose they are not, for contradiction. Then there exists an r' such that

$$F(r', P_1^*(r^*), P_2^*(r^*), P_3^*(r^*)) > F(r^*, P_1^*(r^*), P_2^*(r^*), P_3^*(r^*)). \qquad \text{(A-40)}$$

By definition,

$$F(r', P_1^*(r'), P_2^*(r'), P_3^*(r')) \geq F(r', P_1^*(r^*), P_2^*(r^*), P_3^*(r^*)). \qquad \text{(A-41)}$$

Combining (A-40) and (A-41) yields

$$F(r', P_1^*(r'), P_2^*(r'), P_3^*(r')) > F(r^*, P_1^*(r^*), P_2^*(r^*), P_3^*(r^*)). \qquad \text{(A-42)}$$

Therefore any value of r chosen by the buyer results in the maximization of joint returns. □

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