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RISK SHARING THROUGH BREACH OF CONTRACT REMEDIES

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ABSTRACT

This paper examines the sharing of risk under three different remedies for breach of contract. The risk considered arises from the possibility that, after a seller and buyer have entered into an agreement for the exchange of some (not generally available) good, a third party who values the good more than the original buyer may come along before delivery has occurred; the seller will want to breach. It is shown that this risk is optimally allocated by the expectation damage remedy if the seller is risk neutral and the buyer is risk averse, by the specific performance remedy if the opposite is true, and by a liquidated damage remedy if both parties are risk averse. The level of damages under the liquidated damage remedy is also shown to be bounded by the expectation measure of damages and a "damage equivalent" to the specific performance remedy. By means of a numerical example, it is shown that use of the prevailing remedy for breach of contract--the expectation damage remedy--may plausibly cause a welfare loss of as much as 20% due to inappropriate risk sharing.

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1. Introduction

Whenever parties enter into a contract they realize that circumstances may change and that one of them may want to breach the contract. The remedy available against a breaching party will, of course, influence each party's decision whether to breach. The remedy will also affect each party's investment in "reliance"--expenditures made in anticipation of performance (e.g., building a warehouse to store the goods to be delivered). These effects of contract remedies have been thoroughly examined by Shavell (1980a, 1980b), Rogerson (1980), and others. The remedy for breach will, as well, allocate the risks among the parties due to changed circumstances. This effect, which has not been examined as systematically as the others, is the subject of this paper.[1]

The risk allocation effects of three contract remedies will be analyzed in the context of an example: a buyer and a seller of a good (not generally available in the market) who both know that some third party who values the good more than the original buyer may come along before delivery occurs. Under the _expectation damage_ remedy, if a third-party offer materializes and the seller breaches, the buyer can sue the seller for his lost profits (the parties are assumed to be firms). Under the _specific performance_ remedy, the buyer can sue the seller for delivery of the good. And under a _liquidated damage_ remedy, the buyer can sue the seller for an amount agreed to by the parties in advance, which may exceed the lost profits of the buyer.[2]

The conclusions reached in this paper may be easily summarized. Under the expectation damage remedy, the buyer is, by definition, made indifferent between performance and breach. Thus, since this remedy insures the buyer against the risk of nonperformance and leaves the beneficial risk of selling to the third party entirely on the seller, it optimally allocates the contract risks only when the buyer is risk averse and the seller is risk neutral.

In terms of risk allocation, the specific performance remedy is the mirror image of the expectation damage remedy. If the higher third-party offer materializes, the buyer will demand performance in order to resell to the third party. Thus, the seller's profits do not depend on the possibility of a third-party offer and the buyer bears this beneficial risk. This remedy optimally allocates the contract risks only when the seller is risk averse and the buyer is risk neutral.

Before considering the risk allocation effects of a liquidated damage remedy, it will be useful to reinterpret the specific performance remedy. Assume for simplicity that there is an upper bound to what a third party might offer for the good. Then the specific performance remedy is equivalent to a damage remedy in which the amount paid to the buyer if breach occurs equals this upper bound--the seller will always perform.

A liquidated damage remedy may now be viewed as a compromise between the extremes of the other two remedies. The liquidated damage amount can be greater than the expectation damage award--so that the buyer bears some of the beneficial risk of a third-party offer--but less than the damage equivalent to the specific performance remedy--so that the seller also bears some of this beneficial risk. It will be shown that a liquidated damage agreement optimally allocates the contract risks when both the buyer and the seller are risk averse and that the optimal liquidated damage award is bounded by the expectation measure of damages and the damage equivalent to specific performance. A numerical example is also developed to illustrate concretely how the optimal liquidated damage agreement varies with the risk aversion of the parties.

As far as risk sharing is concerned, the preceding discussion suggests that a liquidated damage remedy should be the normal remedy if, as I assume, parties are generally risk averse at least to some extent. In practice, however, the expectation damage remedy is the normal remedy.[3] The loss of welfare due to inappropriate risk sharing from relying on the expectation damage remedy rather than a liquidated damage remedy (or the specific performance remedy when the buyer is risk neutral and the seller is risk averse) is calculated from the numerical example. The loss ranges in this example from 2% of the value of the contract (when the buyer is much more risk averse than the seller) to 20% of the value of the contract (when the buyer is risk neutral and the seller is very risk averse). Reasons why the expectation damage remedy might still be preferred, despite the generally superior risk sharing effects of a liquidated damage remedy, are discussed in a concluding section of the paper.

2. The Model

The contract situation described here is the simplest one imaginable which still allows discussion of the risk sharing issues. A seller and a buyer enter into an agreement in which the seller promises to produce a good for delivery to the buyer at some price paid in advance. Both parties are assumed to know the probability that a third party will come along and the amount that would be offered. In the event of breach, the buyer's remedy is either expectation damages--the benefit to the buyer if the contract were completed--or specific performance or a liquidated damage payment agreed to by the parties in advance.[4]

The following notation will be used:

$U(.)$	utility of the seller ($U' > 0$, $U'' \leq 0$, $U(0) = 0$)
$V(.)$	utility of the buyer ($V' > 0$, $V'' \leq 0$)
c	seller's production cost
y	buyer's benefit if contract completed ($y > c$)
k	contract price
p	probability of third-party offer

z amount of third-party offer ($z > y$)

δ damage payment to buyer if breach occurs

It is obvious (since $z > y$) that the first-best outcome is for the good to end up in the possession of the third party if the third-party offer materializes. This will occur regardless of the remedy used.[5] Thus, the only issue here is how to best allocate the beneficial risk of the third-party offer between the buyer and the seller.[6]

The buyer's expected utility EV is:

(1) $$EV = (1-p)V(y-k) + pV(\delta-k).$$

The first term reflects the outcome if the third-party offer does not occur, while the second term represents the outcome if the offer does occur and the seller breaches and pays damages. (In the case of specific performance, δ in equation (1) is the "damage equivalent"--see below.)

Similarly, the seller's expected utility EU is:

(2) $$EU = (1-p)U(k-c) + pU(z+k-c-\delta).$$

The optimal contract terms--the contract price and the damage payment--can be determined by maximizing the expected utility of the buyer subject to the constraint that the expected utility of the seller equals some constant, say zero:[7]

(3) $$\underset{k,\ \delta}{\text{Maximize}}\ EV \text{ subject to } EU = 0.$$

Formulating (3) as a Lagrange multiplier problem, the first-order conditions (a unique interior solution is assumed) with respect to k and δ are, respectively:

(4) $$-(1-p)V'(y-k) - pV'(\delta-k)$$

(continued)

$$- \lambda [(1-p)U'(k-c) + pU'(z+k-c-\delta)] = 0,$$

(5) $$pV'(\delta-k) + \lambda [pU'(z+k-c-\delta)] = 0,$$

where λ is the Lagrange multiplier. Solving (5) for λ and substituting this into (4) leads, after some simplification, to:

(6) $$\frac{V'(y-k)}{V'(\delta-k)} = \frac{U'(k-c)}{U'(z+k-c-\delta)} .$$

This condition can be given a familiar interpretation: the marginal rates of substitution between the "goods" of "income if performance occurs" and "income if breach occurs" must be the same for both parties. The remaining first-order condition, with respect to λ, is of course the constraint that the seller's expected utility is zero:

(7) $$(1-p)U(k-c) + pU(z+k-c-\delta) = 0.$$

Conditions (6) and (7) together determine the optimal damage payment, δ^*, and the optimal contract price, k^*.

The optimal breach of contract remedy will be said to be the expectation damage remedy if $\delta^* = y$, the specific performance remedy if $\delta^* = z$ (this is the "damage equivalent" to specific performance),[8] and a liquidated damage remedy if $y < \delta^* < z$.[9]

3. Analysis of the Remedies

The analysis of the remedies when at least one of the parties is risk averse[10] is presented in this section in the form of three propositions. Since the intuition behind these results has been discussed in the introductory section, no further comments will be made here about the optimal remedies. However, following each proposition, there will be a brief discussion of the optimal contract price.

Proposition 1: *If the buyer is risk averse and the seller is risk neutral, then the expectation damage remedy optimally allocates the contract risks* ($\delta^* = y$).[11]

Proof: Since the seller is risk neutral, $U'(.) =$ constant. Thus, (6) reduces to:

(8) $V'(\delta-k) = V'(y-k)$.

Since V' declines continuously, (8) implies that $\delta = y$. Q.E.D.

In this case, the optimal contract price is:

(9) $k^* = c - p(z-y) < c$.[12]

The seller is willing to accept a contract price below his production cost since, under the expectation damage remedy, he receives more than his production cost if the third-party offer materializes. To be precise, he is willing to accept a contract price less than production cost to the extent of the expected gain from the third-party offer, $p(z-y)$.

Proposition 2: *If the seller is risk averse and the buyer is risk neutral, then the specific performance remedy optimally allocates the contract risks* ($\delta^* = z$).[13]

Proof: Since the buyer is risk neutral, (6) becomes

(10) $U'(k-c) = U'(z+k-c-\delta)$,

which implies that $\delta = z$. Q.E.D.

In this case, the optimal contract price is:

(11) $k^* = c$.[14]

The seller demands a contract price equal to his production cost since, under the specific performance remedy, he receives none of the benefits of a third-party offer.

Proposition 3: If both parties are risk averse, then a liquidated damage remedy optimally allocates the contract risks. The optimal liquidated damage payment is bounded by the expectation measure of damages and the level of damages equivalent to specific performance ($y < \delta^* < z$).[15]

Proof: This will be proved by contradiction. Suppose $\delta \leq y$. Then, by the declining marginal utility of V and U, $V'(y-k)/V'(\delta-k) \leq 1$ and $U'(k-c)/U'(z+k-c-\delta) > 1$. This contradicts (6). Similarly, if $\delta \geq z$, then $V'(y-k)/V'(\delta-k) > 1$ and $U'(k-c)/U'(z+k-c-\delta) \leq 1$, again contradicting (6). Thus, $y < \delta < z$. Q.E.D.

In this case, the optimal contract price is bounded by the contract prices under the expectation damage remedy and the specific performance remedy:

(12) $c - p(z-y) < k^* < c$.[16]

The exact contract price depends, of course, on the optimal liquidated damage payment. The higher the damage payment, the higher the contract price demanded by the seller since his expected gain from the third-party offer is less.[17]

4. An Example

The way in which the optimal damage payment and the optimal contract price vary with the risk aversion of the parties can be illustrated by an example. The utility functions of the seller and of the buyer are assumed to be of the quadratic form:

(13) $U(x) = x - sx^2$,

(14) $V(x) = x - bx^2$,

where $s \geq 0$ and $b \geq 0$ are risk aversion parameters. A zero value of the parameter corresponds to risk neutrality, and the higher the value, the more risk averse is the party.[18] The remaining data for the example are:[19]

\$500	seller's production cost
\$1,000	buyer's benefit if contract completed
.05	probability of third-party offer
\$10,000	amount of third-party offer

Thus, the expectation measure of damages is \$1,000 and the damage equivalent to specific performance is \$10,000.

Table 1 shows the optimal damage payment, $\delta*$, and the optimal contract price, $k*$, for different degrees of risk aversion of the seller and the buyer. The values of the risk aversion parameter are chosen so that the certainty equivalent of a 50-50 chance of zero or \$10,000 is \$5,000, \$4,500, etc.[20] For the first column in Table 1, in which the buyer is risk averse and the seller is risk neutral, Proposition 1 and (9) imply that $\delta* = \$1,000$ and $k* = \$50$ (the expected gain to the seller of the third-party offer, $p(z-y)$, is \$450). For the first row, in which the buyer is risk neutral and the seller is risk averse, Proposition 2 and (11) imply that $\delta* = \$10,000$ and $k* = \$500$. For the remaining cases, in which both parties are risk averse, $\delta*$ ranges between \$1,000 and \$10,000 (the low and high values are \$3,152 and \$7,641) and k* ranges between \$50 and \$500 (the low and high values are \$195 and \$395), as expected from Proposition 3 and (12). Note that, holding the buyer's risk aversion constant, both the damage payment and the contract price rise as the seller's risk aversion increases--thereby reducing the (beneficial) risk imposed on the seller. Conversely, holding the seller's risk aversion constant, the damage payment and contract price both fall as the buyer's risk aversion increases.

As mentioned in the introduction, the expectation damage remedy is the normal remedy in practice. However, only when the seller is risk neutral does this lead to the optimal allocation of the contract risk. In every other case, use of the expectation remedy lowers at least one of the party's expected utility below what it otherwise could be. Since the seller's expected utility is held constant, this welfare loss can be calculated as the difference between the value to the buyer, w*, of the optimal contract and the value to the buyer, w^e, of a contract with the expectation remedy, $\delta = y$, and the corresponding contract price (9). In other words, the welfare loss is $w* - w^e$, where w* and w^e are defined implicitly by:

(15) $V(w*) = (1-p)V(y-k*) + pV(\delta*-k*)$,

(16) $V(w^e) = V(y-[c - p(z-y)])$.

TABLE 1

OPTIMAL DAMAGE PAYMENT AND CONTRACT PRICE

seller's risk aversion

buyer's risk aversion

certainty equivalent of 50-50 chance of 0 or $10,000	$5,000 (risk neutral)	$4,500	$4,000	$3,500	$3,000 (most risk averse)
$5,000 (risk neutral)	indeterminate[a/]	$10,000 $500	$10,000 $500	$10,000 $500	$10,000 $500
$4,500	$1,000 $50	$5,430 $288	$6,662 $349	$7,266 $377	$7,641 $395
$4,000	$1,000 $50	$4,159 $235	$5,379 $299	$6,054 $332	$6,502 $353
$3,500	$1,000 $50	$3,537 $210	$4,669 $273	$5,339 $308	$5,801 $331
$3,000 (most risk averse)	$1,000 $50	$3,152 $195	$4,199 $257	$4,845 $293	$5,305 $316

damage payment contract price

Note: See text for details.

[a/] Any $k > 0$ and δ satisfying $\delta = 20k$ is optimal.

Table 2 shows the absolute welfare loss, as well as the welfare loss as a percentage of the value of the optimal contract, w^*, from using the expectation damage remedy rather than a liquidated damage remedy (or the specific performance remedy when the buyer is risk neutral and the seller is risk averse). In the case most favorable to the expectation damage remedy--when the buyer is most risk averse (certainty equivalent of $3,000 in Table 2) and the seller is only slightly risk averse (certainty equivalent of $4,500)--the welfare loss represents a 2% reduction in the value of the contract. In the case least favorable to the expectation damage remedy--when the buyer is risk neutral and the seller is most risk averse--the welfare loss corresponds to a 20% reduction in the value of the contract. Thus, the example suggests that in plausible circumstances the inappropriate allocation of contract risks under the expectation damage remedy can be of some importance.

5. Concluding Remarks

Assuming that parties to a contract are risk averse to some extent--even if only slightly--the analysis in this paper argues for use of a liquidated damage remedy. Why is it then that the normal remedy imposed by the courts is the expectation damage remedy? Considerations of information, breach, and reliance--not included in the model used here--might explain this.

TABLE 2

WELFARE LOSS FROM USING EXPECTATION DAMAGE REMEDY

		seller's risk aversion				
	certainty equivalent of 50-50 chance of 0 or $10,000	$5,000 (risk neutral)	$4,500	$4,000	$3,500	$3,000 (most risk averse)
buyer's risk aversion	$5,000 (risk neutral)	$0 0%	$65 7%	$114 12%	$154 16%	$189 20%
	$4,500	$0 0%	$32 3%	$72 8%	$107 12%	$140 16%
	$4,000	$0 0%	$23 3%	$55 6%	$87 10%	$116 13%
	$3,500	$0 0%	$18 2%	$46 5%	$75 9%	$102 12%
	$3,000 (most risk averse)	$0 0%	$16 2%	$40 5%	$66 8%	$91 11%

welfare loss percentage loss

Note: See text for details.

The specific performance remedy requires no information in order to be implemented by a court, while the expectation damage remedy only requires the court to know (or to estimate) the buyer's benefit if the contract had been completed. A liquidated damage remedy, however, encourages the parties to take into account every facet of the contract when negotiating the damage payment in advance, including their relative aversion to risk and the likelihood and magnitude of third-party offers.

If the parties can renegotiate (including with a third party) when circumstances have changed, then all of the remedies will lead to efficient breach decisions. However, when renegotiation is impossible (or very costly), Shavell (1980a, p. 483) has shown that only the expectation damage remedy will induce efficient breach decisions. It is clear from the results presented here that a liquidated damage remedy would lead to too few breaches since damages are higher than under the expectation remedy, and that the specific performance remedy would be even worse.

If the parties negotiate over all terms of a contract, including each other's reliance decisions, then all of the remedies will lead to efficient reliance decisions. However, when it is too costly to include the reliance decision as one of the terms of the contract, Shavell (1980a, p. 478) has shown that the expectation damage remedy leads to too much reliance, while Rogerson (1980, pp. 47-48) has demonstrated that the specific performance remedy is better, and that a liquidated damage remedy is best.

When these additional considerations are taken into account, it is clear that no one remedy for breach of contract is best in every respect. It may be that, all things considered, the expectation damage remedy usually will come out on top, although one can imagine plausible situations in which risk sharing considerations may be of primary importance and in which one of the other remedies may be preferable.

Notes

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1) The studies which have emphasized the role of risk allocation in contract law have focused on the doctrines of excuse, impossibility and foreseeability rather than, as here, the remedies for breach. See, for example, Posner and Rosenfield (1977), Joskow (1977), and Perloff (1981, forthcoming). Several studies have also considered the risk allocation effects of breach of contract remedies, although not in the way developed here. The ones which are most closely related to the present analysis are by Kornhauser (1980, 1981), Rogerson (1980), and Shavell (1980a, 1980b). See also Goetz and Scott (1977). These will be discussed further below.

2) It will be shown below that the liquidated damage payment agreed to by the parties will never be less than the buyer's lost profits.

3) See, for example, Farnsworth (1970).

4) In practice, the expectation damage and specific performance remedies are imposed upon the parties by a court, whereas a liquidated damage remedy is determined by the parties themselves. This distinction will not be of concern here.

5) It will be shown below that the damage payment under the expectation and liquidated damage remedies will be less than the third party's offer. Thus, under these remedies the seller will breach and resell to the third party. Under the specific performance remedy, the buyer will demand performance and then resell to the third party.

6) Alternatively, one could motivate the risk alloction problem by assuming that there is some detrimental risk, such as the possibility that the value of performance to the buyer decreases (say because the good is defective). Results analogous to the ones developed here could be generated. See Kornhauser (1981, pp. 15-17).

7) There is a natural interpretation of the constraint that the seller's expected utility is zero. Suppose there are many potential sellers who compete for the contract to produce a custom-made good for the buyer. Thus, if all sellers had the same utility function, competition would lead to the same expected utility for each seller. And if sellers have an option of earning zero profits in a riskless activity then, since U(0) = 0, EU = 0 is the appropriate

common level of expected utility.

8) If $\delta = z$, the seller would be indifferent between performance and breach if the third-party offer materializes. It will be assumed that performance will occur in this case. Obviously, any $\delta > z$ would also be equivalent to specific performance.

9) In principle, a liquidated damage agreement could lead to $\delta < y$. It is shown below that, in fact, this would never occur.

10) When both parties are risk neutral, all three remedies are equally desirable (which is not surprising since the only problem considered in this paper is how to optimally allocate risk).

11) This result has been noted by several others. See Kornhauser (1981, pp. 15-18), Rogerson (1980, pp. 44-45), and Shavell (1980a, pp. 487-88; 1980b, p. 13).

12) Without loss of generality, assume $U(x) = x$. Then (9) follows directly from (7).

13) This result has been suggested by Shavell (1980b, p. 33). In a different model (see footnote 6 above), Kornhauser (1981, pp. 16-17) has stated an analogue to this result.

14) Given $\delta = z$, the seller's expected utility is $U(k-c)$. Then (11) follows from $U(0) = 0$.

15) Kornhauser (1980, pp. 12-19; 1981, pp. 16-19) discusses the desirability of a liquidated damage remedy when both parties to a contract are risk averse, but does not relate the optimal liquidated damage payment to the expectation damage or specific performance remedies. Goetz and Scott (1977) also advocate use of a liquidated damage remedy, but their primary concern is with protecting "idiosyncratic" and other difficult to measure losses, which is not an issue here.

16) Since the seller is risk averse, his expected profits must be positive when his expected utility is zero:

$$(1-p)(k-c) + p(z+k-c-\delta) > 0.$$

The first inequality in (12) follows directly from this condition. If $k \geq c$, the seller's expected utility is positive since $U(k-c) \geq 0$ and $U(z+k-c-\delta) > 0$. The second inequality in (12) follows from the fact that this would contradict the zero expected utility constraint.

17) Totally differentiating (7) with respect to δ shows that

$$\frac{dk}{d\delta} = \frac{pU'(z+k-c-\delta)}{(1-p)U'(k-c) + pU'(z+k-c-\delta)} > 0.$$

18) The values of s and b are limited to ranges such that $U'(x) = 1 - 2sx > 0$ and $V'(x) = 1 - 2bx > 0$. Although the quadratic utility function does not exhibit decreasing absolute risk aversion, this does not lead to peculiar results in the present application.

19) These values guarantee that the seller will produce the good and enter into a contract with the buyer (rather than, for example, producing the good solely for the possibility of selling it to the third party).

20) The values of b and s used (and the corresponding certainty equivalents) are 0 ($5,000), .000016807 ($4,500), .000029412 ($4,000), .000039735 ($3,500), and .000048780 ($3,000).

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