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# Damage Measures for Inadvertant Breach of Contract

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We analyze contractual situations where breach is inadvertant rather than deliberate. We consider the effects of alternative remedies for breach on ex ante precaution and reliance decisions. Neither the expectation measure nor the reliance measure of damages induces efficient precautions and reliance. The expectation measure leads to excessive reliance, while the reliance measure leads to excessive reliance and less than efficient precaution. The expectation measure, however, is Pareto-superior to the reliance measure. This result is robust to various informational assumptions. 

## I. Introduction

Contracts may be breached either deliberately or inadvertantly. Although the deliberate breacher determines affirmatively not to perform and thus bear the aftermath of his decision, the inadvertant breacher possesses a different motivation. Breach or performance may occur regardless of his intent; his actions prior to their realization may determine only the relative likelihood of each occurrence.

A deliberate breach may be typified by the case of *Peevyhouse v. Garland Coal and Mining Co.* (1963).[1] The plaintiffs leased a piece of land to the defendant to mine coal; under the contract, the defendant agreed to restore the site at the end of the lease. By that time, the defendant discovered that the cost of restoration was about $29,000, while

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[1]382 P.2d 109 (S. Ct. Okla. 1963).

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the expected increase in market value of the site due to the repair was only $300. The defendant breached.

In this case, performance would have been inefficient. There has been very comprehensive economic analysis of such deliberate breach of contract, and, in particular, the effect of various remedies for breach. Shavell (1980, 1984) was the first to analyze the effect of damage measures on the two behavioral decisions of the parties: the breach decision and the reliance decision.[2]

By contrast, the situation of *inadvertant* breach, in which a party's failure to perform is not deliberate, may be exemplified by the case of *Security Stove & Mfg. Co.* v. *American Ry. Express Co.* (1932).[3] Here, the plaintiff planned to display an oil and gas burner at an exhibition in Atlantic City. The defendant contracted to transport the burner from Kansas City to Atlantic City by a set date. Because the defendant delivered one part late, the burner could not be displayed at the exhibition. Reliance damages were awarded to the plaintiff. This type of breach is inadvertant, because the breacher had no incentive to deliver the part late, nor did he realize any cost saving by his conduct. Here, there is no decision to breach: at some moment, performance simply becomes impossible.

In examining such cases, which are clearly abundant and important, we observe again that legal remedies for breach affect two types of decisions. Parallel to the case of deliberate breach, there is a reliance decision. But although there is no breach decision, there is a preliminary determination as to how much effort to invest in precautions. The "potential breacher" may influence the likelihood of inadvertant breach by employing different degrees of precautions against nonperformance.

Kornhauser (1983) provided the first economic analysis of remedies for inadvertant breach. Further contributions include Cooter (1985), who identified the parallels between deliberate breach and issues of tort and property, and Craswell (1988a, 1988b, 1989). Cooter and Ulen (1997, pp. 221–232), compare the effects of two standard damage measures—the expectation and reliance measures—on precaution, but not on reliance.[4]

In this paper, we develop a framework that allows a full analysis of the expectation and reliance measures in a general setting with particular regard for the timing of the precaution and reliance decisions.[5] We then compare these results with those from the previous research into damage remedies for deliberate breach.

Specifically, we consider a sale transaction where the seller's actions affect the likelihood of nonperformance, and the buyer invests in reliance. The interaction between the parties is such that the likelihood of breach influences the reliance decision, while the reliance decision, in turn, could affect the precaution level and the likelihood of breach.

We distinguish between two possible sequences of actions. In the case of *observed reliance*, the seller observes the buyer's reliance before choosing his precaution, i.e., the parties move sequentially. In the case of *unobserved reliance*, the seller does not observe

[2]Further contributions building on Shavell's analysis include Polinsky (1983), Rogerson (1984), Leitzel (1989), and Emons (1991).

[3]51 S.W. 2d 572 (1932).

[4]In analyzing the reliance decision, Cooter and Ulen (1997) focus on the "perfect expectation measure," which is the expectation measure given socially optimal reliance.

[5]Because we focus on general remedies, we ignore individually tailored solutions such as liquidated damages. In the closing section we comment on specific performance and two other standard damage measures—restitution and no damages.

the buyer's reliance before choosing his precaution, i.e., the parties move simultaneously. Shavell (1980) and Emons (1991) analyzed deliberate breach with observed and unobserved reliance, respectively.

Broadly, we find that the conclusions of Shavell and Emons about the efficacy of damage measures in the case of deliberate breach largely hold also in the case of inadvertant breach. Expectation damages induce efficient levels of precautions, but excessive reliance. Reliance damages lead to underinvestment in precautions and excessive levels of reliance that exceed even the distortion that arises under the expectation measure. If the reliance decision is observable by the promisor, reliance will be even more excessive relative to the case of unobserved reliance, while the precaution level will be closer to the optimum. Finally, we find that the expectation measure is Pareto-superior to the reliance measure.

The remainder of our paper is organized as follows. Section II describes the framework of the analysis, and derives the efficient levels of precaution and reliance. Sections III and IV examine the parties' behavior under the expectation and the reliance measures, respectively. Section IV shows that the expectation measure is Pareto-superior to the reliance measure. Finally, Section V offers some concluding remarks.

## II. Analytical Framework

### *Assumptions*

A buyer and a seller contract at a lump-sum price for the sale of a good or provision of a service. Following contract formation, the buyer selects a reliance expenditure $R$, to enhance his valuation of performance, should performance occur. The seller chooses a level $X$ of precaution expenditures against inadvertant breach, which determines the likelihood of "successful" performance. Let $P(X)$ denote the probability of performance; it is assumed that $P' > 0$, $P'' < 0$, $\lim_{x \to 0} P' = \infty$, $P(0) > 0$. The value of performance to the buyer is $V(R)$, where $V' > 0$, $V'' < 0$, $\lim_{R \to 0} V' = \infty$, $V(0) > 0$.

In the following analysis, we will distinguish two cases:

- *Unobserved reliance*: The seller does not observe $R$ before choosing $X$. Either $R$ has not been chosen yet, or it has been chosen but is not observable. Formally, the parties move simultaneously.[6]
- *Observed reliance*: The seller observes $R$ before choosing $X$, i.e., the parties move sequentially.[7]

It is assumed throughout that, prior to his choice of precaution, the seller knows the magnitude of damage that the buyer would incur in the event of breach.[8] Further, we assume that the buyer's and seller's rationality is common knowledge. We do not allow the contract price to depend on precaution or reliance, because we intend to consider how the general rules of damages motivate the precaution and reliance decisions, and how efficiently they may replace specific agreements about contingent levels of precaution and reliance. We assume that both buyer and seller are risk neutral.

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[6]Emons (1991) analyzes a deliberate breach in a setting where the seller cannot observe the buyer's reliance decision.

[7]Shavell (1980) adopts this assumption concerning the sequence of events. In his model, it is natural, because the breach decision occurs a long time after the reliance decision.

[8]This assumption is conventional in the literature on remedies for breach. The situation in which the magnitude of damages is not known to the seller is analyzed in Bebchuk and Shavell (1992).

*Optimal Levels of Precautions and Reliance*

*Optimal Precautions.* Let $X^*(R)$ be the optimal level of $X$, given $R$. $X^*$ is the solution to

$$\max_x V(R)P(X) - X, \tag{1}$$

and is defined by the first order condition:

$$V(R)P'[X^*(R)] = 1$$

or:

$$P'[X^*(R)] = \frac{1}{V(R)} \tag{2}$$

Expression (1) denotes the expected return for precautions, less the cost of these precautions. Optimal precautions are those that generate the highest net return for any given level of reliance.

Expression (2) characterizes the seller's optimal precautions, given the buyer's actual level of reliance, $R$. Notice that $X^*$ rises with $R$ (i.e., $dX^*(R)/dR > 0$): by (2), a higher $R$ implies a higher $V(R)$, a lower value for the right hand side, and hence, a higher value for $X^*$. Intuitively, when more reliance expenditures are invested, the value of performance is increased, and the social loss due to breach is greater. Thus, investment in precaution becomes more valuable, and its optimal level rises.

*Optimal Reliance.* Let $R^*(X)$ denote the optimal level of $R$, given $X$. It solves

$$\max_R V(R)P(X) - R, \tag{3}$$

and it is defined by the first-order condition:

$$P(X)V'[R^*(X)] = 1$$

or:

$$V'[R^*(X)] = \frac{1}{P(X)} \tag{4}$$

Here, for any given probability of breach, $R$ should be increased as long as its return—the incremental increase in expected value from performance—exceeds the additional investment.

Expression (4) indicates that $R^*$ rises with $X$ (i.e., $dR^*(X)/dX > 0$): a higher precaution level raises the expected return for any given level of reliance (the performance contingency becomes more likely; hence, the return for reliance expenditures is realized more frequently), thus reliance becomes more profitable and its optimal level must rise.

*Social Optimum.* Let $X^*$, $R^*$ be the social optimum, i.e., the levels that maximize $V(R)P(X) - R - X$. They satisfy the following:

$$X^* = X^*(R^*)$$

$$R^* = R^*(X^*)$$

or, substituting from Expressions (2) and (4),

$$V(R^*)P'(X^*) = 1$$

$$V'(R^*)P(X^*) = 1$$

Under the convexity assumptions on $P(X)$ and $V(R)$, the social optimum is unique. Only contracts for which $V(R^*)P(X^*) - R^* - X^* > 0$ should be entered into.

## III. Expectation Measure

The expectation measure awards the buyer damages equal to his expectation in the event of breach. The buyer's expectation is $V(R)$; hence, this is the damage under the expectation measure. We now analyze the buyer's reliance and the seller's precaution.

### *Reliance*

For any level of $R$ the buyer chooses, he is assured of gaining a return of $V(R)$, regardless of whether breach or performance occurs. Therefore, the buyer's objective is to choose $R$ so as to maximize the certain return, $V(R)$, minus the expenditure. Let $R^e$ maximize $V(R) - R$. $R^e$ is defined by:

$$V'(R^e) = 1 \tag{5}$$

which maintains that $R$ will be adjusted to a level such that the marginal return equals the marginal cost. We can now compare this behavior to the socially optimal level of reliance.

PROPOSITION 1: *The expectation measure of damages induces an excessive level of reliance, i.e.,* $\mathrm{R^e > R^*}$. *In fact,* $\mathrm{R^e > R^*(X)}$ *for any* X.

*Remarks.* The intuitive explanation for this result is the following. The optimal reliance level depends on the probability of nonperformance—the higher such probability, the lower is the optimal reliance. Under the expectation measure, however, the buyer fails to account for this possibility when relying. The buyer does not care about $P(X)$ because he gets the same payoff of $V(R^e)$ regardless of the contingency. Consequently, he invests excessively in reliance.

PROOF: From (4) we know that $\forall X$, $V'[R^*(X)] > 1$ (because $P(X) < 1$). From this and Expression (5) we have:

$$V'(R^e) < V'[R^*(X)],\ \forall X,$$

and because $V' < 0$, it follows that $R^e > R^*(X)$ for all $X$, in particular for $X^*$. Q.E.D.

### *Precautions*

Let $X^e$ be the level of precaution that the seller selects under the expectation measure. The seller's objective is to minimize the sum of his expenditures on precautions plus the damage payment he would have to make in the event of breach. Because breach occurs with probability $1 - P(X)$, the seller seeks to minimize $X + [1 - P(X)]\,V(R^e)$. Note that the magnitude of damages, $V(R^e)$, is independent of $X$, because we established that the buyer's choice of $R$ does not depend on the probability of breach. $X^e$ is defined by:

$$P'(X^e)\,V(R^e) = 1$$

or,

$$P'(X^e) = \frac{1}{V(R^e)} \tag{6}$$

PROPOSITION 2: *The seller chooses a level of precautions that is efficient, given the actual level of reliance, i.e.,* $X^e = X^*(R^e)$.

*Remarks.* The reason that the seller's conduct is efficient is similar to the one that explains the same result in the case of deliberate breach: the seller's decision does not impose any externalities. The buyer's actual loss from breach is internalized by the seller; thus, the seller's optimization problem is identical to the social one. Accordingly, the seller's choice is efficient, given the already established level of reliance $R^e$.

Because $R^e > R^*$, then $X^e > X^*$. The reason for this excessive level of precaution is the following. Under the expectation measure, the buyer chooses an excessive level of reliance, and hence, makes the breach contingency more costly for the seller than it would have been under optimal reliance. Hence, the seller increases his expenditures on precautions, to reduce the likelihood of sustaining this enhanced cost.

Moreover, observe that under the expectation measure, it is irrelevant whether the seller observes the actual $R$ before choosing precautions. He is able to deduce the precise $R^e$, from which the buyer has no incentive to deviate.

PROOF: Expression (2), when applied to the specific case where $R = R^e$, is identical to expression (6). Thus, the solutions to both equations are identical, which establishes the optimality of the seller's choice under the expectation measure.

## IV. Reliance Measure

The reliance measure awards the buyer damages equal to his reliance expenditure, $R$, in the event of breach. Behavior under the reliance measure depends on whether the seller observes the buyer's reliance when choosing his level of precautions. We, therefore, separately analyze the cases of observed and unobserved reliance.[9] The reason for the different results stems from the buyer's ability to affect the seller's choice of $X$ when he knows that the seller observes his reliance and anticipates the damage burden. Hence, we find it useful to begin by analyzing this dependence, namely how the seller adjusts his precaution level according to the level of reliance he either observes or anticipates.

### *Precautions*

Denote by $R_s$ the level of reliance that the seller expects (or observes) the buyer to take. The seller's choice of precautions under the reliance measure, $X^r$, would be a function of $R_s$. Because the probability of breach is $1 - P(X)$, the seller chooses $X^r(R_s)$ to minimize $X + [1 - P(X)]R_s$. It is defined by the first-order condition:

$$P'[X^r(R_s)] = \frac{1}{R_s} \tag{7}$$

[9] A third case, in which the buyer observes $X$ when choosing reliance is redundant, because it is equivalent to the case of unobserved reliance. This will be proven below.

PROPOSITION 3: *Under the reliance measure of damages, for any given level of reliance, the seller will invest too little in precautions, relative to the socially optimal level, i.e.,* $X^r(R_s) < X^*(R_s)$.

*Remarks.* The seller underinvests in precautions because he has to guard against only part of the loss that may occur. Although the total loss from breach is $V(R_s)$, the seller would sustain only a fraction of it, $R_s$. Note that $R < V(R)$ for all $R$, because the value of the contract must at least cover the reliance. In other words, the inefficiency of the seller's conduct originates from an externality: his behavior imposes uncompensated costs that the buyer, not himself, has to bear.

To identify $X^r$, the actual level chosen, we need to determine the actual level of the buyer's reliance. We turn to analyze the buyer's choice of reliance, $R^r$, and we shall return later to resolve the seller's behavior in equilibrium, where we assume $R_s = R^r$.

PROOF: Comparing expressions (2) and (7), it is clear that $P'[X^r(R_s)] > P'[X^*(R_s)]$, which in turn, implies that $X^r(R_s) < X^*(R_s)$. Q.E.D.

*Reliance*

In the event of breach, the buyer receives damages of $R$ from the seller, while in the event of no breach, the buyer will enjoy the value $V(R)$. Hence, the buyer's expected return is $P(X^r)V(R) + [1 - P(X)]R - R$. Thus, the buyer chooses $R$ to maximize $P(X^r(R))(V(R) - R)$. Let $R^r$ denote the buyer's choice of reliance.

Notice that the buyer earns exactly nothing when breach occurs. Hence, in choosing reliance, he considers only his position when there is performance and the effect of his reliance on the seller's likelihood of performance. The effect of the buyer's reliance on the likelihood of performance depends on the seller's information at the time of deciding precautions.

*Observed Reliance.* Here, the seller's choice of precautions is a function of reliance, and the buyer weighs this impact when choosing $R^r$. He thus chooses $R$ to maximize $P(X^r(R))(V(R) - R)$. Differentiating with respect to $R$ yields:

$$[V'(R^r) - 1]P[X^r(R^r)] + [V(R^r) - R^r]P'(X^r(R^r))\frac{dX^r(R)}{dR} = 0,$$

or, after substituting from (7),

$$V'(R^r) = 1 - \frac{V(R^r) - R^r}{P(X^r(R^r))\,R^r}\frac{dX^r(R)}{dR}. \tag{8}$$

We can state the following proposition:

PROPOSITION 4: *Under the reliance measure, when the seller observes the buyer's reliance before choosing precautions, the buyer's reliance will exceed the optimal reliance as well as the level of reliance that was chosen under the expectation measure:* $R^r > R^e > R^*(X)\ \forall X$.

*Remarks.* The buyer's motivation for choosing a higher level of reliance in this case is the following: by raising $R^r$, the buyer makes nonperformance relatively more costly for the seller, because this is the contingency where the seller has to pay $R^r$. This induces the seller to raise the level of precautions, so as to reduce the likelihood of suffering the cost of increased damages. With higher level of precautions, the buyer would be more likely to receive $V(R)$, rather than just $R$, and we know that $V(R) > R$. By inflating his reliance expenditures, the buyer realizes a higher payoff, at no cost—because reliance is always "free" to him.

Proposition 1 showed that the expectation measure also implements an excessive level of reliance. The present proposition claims that, if the seller observes the reliance decision, the reliance measure induces an even higher reliance expenditure. The reason is the following. Just as under the expectation measure, the buyer fails to account for the possibility of nonperformance and to discount the reliance level accordingly. But here there is another effect that was not present under the expectation measure: the buyer's ability to induce the seller to vary the probability of performance. The combination of these two effects leads to the greater degree of reliance.

PROOF: Examine expression (8). We know that the derivative of $X^r(R)$ with respect to $R$ is positive: this follows from expression (7) which defines $X^r$.[10] And since $V(R) - R$ is always positive, we establish that the right-hand side of (8) is less than 1; hence, $V'(R^r) < 1$. From this, from (5), and from the assumption that $V' < 0$, it follows that $R^r > R^e$. The relation between $R^e$ and $R^*$, which was established in Proposition 1, completes the proof. Q.E.D.

*Unobserved Reliance.* Here, the seller cannot condition his choice of $X$ on $R^r$. Although in equilibrium, the value of $R$ that the seller anticipates $R_s = R^r$, the buyer cannot manipulate the seller's choice of $X$ through shifts in $R$. The buyer's choice of reliance would not affect the probability of breach, i.e., $dP/dR = 0$. Therefore, the buyer chooses $R$ to maximize $V(R) - R$. The solution, $R^r$, is defined by

$$V'(R^r) = 1. \tag{9}$$

PROPOSITION 5: *Under the reliance measure, when the seller cannot observe the buyer's reliance before choosing precautions, the buyer's reliance is equal to his reliance under the expectation measure:* $R^r = R^e$.

*Remarks.* Here, the reliance level is identical to the level under the expectation measure regime; thus, it exceeds the efficient level. In the event that the contract is breached, the seller must reimburse the buyer for his reliance expenditures; hence, reliance is free to the buyer, and he ignores such potential waste. Only if the contract is performed must the buyer balance the marginal benefit of reliance, $V'(R)$, against its marginal cost of 1. Yet this is precisely the problem he faced under the expectation measure.

By Propositions 4 and 5, the reliance level would be greater in the case in which the seller can observe it. Only in this case can the buyer utilize his reliance strategy to manipulate the seller's precaution decision and so to influence the likelihood of breach.

PROOF: Expressions (5) and (9) denote an identical condition. Thus, $V'(R^e) = 1$ and $V'(R^r) = 1$; hence $R^r = R^e$. Q.E.D.

### *Further Analysis of Precautions*

In equilibrium, $R_s = R^r$. Substituting this equality into Expression (7), which denotes the condition for the seller's choice of precautions under the reliance measure, we get

[10] It is also intuitive: higher reliance makes breach contingencies more costly to the seller; thus, he values precautions more.

$$P'(X^r) = \frac{1}{R^r}. \tag{10}$$

PROPOSITION 6: *Under the reliance measure, the precaution level of a seller that can observe the buyer's reliance exceeds the precaution level that is taken by a seller that cannot observe the buyer's reliance.*

*Remarks.* The intuition for this result is apparent from the discussion above. We noted that when the seller observes the buyer's reliance, the buyer exploits this to induce the seller to raise his precaution level. He does so by inflating his reliance spending, so as to make breach costlier for the seller.

However, note that in both cases, the precaution level is lower than the optimal level, given the buyer's reliance decision: $X^r < X^*(R^r)$. This follows from Proposition 3. Thus, although the reliance level was closer to optimal in the case in which the buyer's reliance is not observed, the precaution level is more efficient in the other case, in which the buyer's reliance is observed.

PROOF: From expression (10), we know that $X^r$ rises with $R^r$. And from Propositions 4 and 5, which established that reliance is greater if observed by the seller, we conclude that the seller's precautions are greater when he observes the buyer's reliance. Q.E.D.

To complete the discussion on the reliance measure, we explain why the "third case," in which the buyer observes the seller's precautions before relying, is redundant.[11] The results in such a scenario are identical to those in the case of unobserved reliance essentially because the buyer cannot affect the probability of breach. Regardless of whether the buyer observes the actual $X^r$, his choice of $R$ will affect his payoff only if there is performance. Hence, he chooses $R$ to maximize his performance-contingent payoff $[V(R) - R]$. He cannot influence the likelihood of performance. Referring to the subsection above, this is exactly identical to the buyer's situation in the case of unobserved reliance.

*Expectation vis-à-vis Reliance Measure*

The analysis above demonstrates that both damage measures lead one or both parties to deviate from efficient reliance and precautions. The expectation measure induces excessive reliance, which in turn, generates too much precaution. The reliance measure leads to the same reliance and precaution when the seller cannot observe the buyer's reliance when choosing precaution, but higher levels of reliance and precaution when the seller can observe the buyer's reliance when choosing precaution. Our results for reliance in the cases of unobserved and observed reliance are similar to those of Emons (1991) in a setting of deliberate breach.

Given the effects on breach and precaution, we can easily compare the social welfare outcomes of the two remedies.

PROPOSITION 7: *The expectation measure is Pareto-superior to the reliance measure.*

PROOF: For any given levels of $R$ and $X$, social welfare is given by $V(R)P(X) - X - R$. Welfare under the reliance measure is

[11]This case is similar to the Stackelberg model of industrial organization in which producers compete on quantities, and one can choose its production before the other.

$$V(R^r)\,P(X^r) - X^r - R^r \leq$$

$$\leq V(R^e)\,P(X^r) - X^r - R^e <$$

$$< V(R^e)\,P(X^e) - X^e - R^e.$$

The first (weak) inequality follows from the fact that given $X$, $R^e$ is either closer to $R^*(X)$ than $R^r$ (in the case of observed reliance), or equal to $R^r$ (in the case of unobserved reliance). The second inequality follows from the fact that $X^e = X^*(R^e)$, namely that $X^e$ maximizes $\{P(X)\,V(R^e) - X\}$. Q.E.D.

## V. Hypothetical Expectation Measure

We have confirmed that when breach is inadvertant, both the expectation and reliance measures fail to implement the optimal levels of precautions and reliance. As in the case of deliberate breach, there exists a damage measure that can, theoretically, lead to the efficient outcome.[12] This measure, the "hypothetical expectation measure," assures the buyer a damages award of $V(R^*)$—his hypothetical expectation had he invested optimally in reliance—in the event of breach, regardless of the buyer's actual investment in $R$.

In this case, the buyer's objective is to choose $R$ as to maximize $V(R)P(X) - R$, and the seller's objective is to choose $X$ as to maximize $V(R^*)P(X) - X$.

PROPOSITION 8: *Under the hypothetical expectation measure of damages, efficient reliance and precautions arise: the buyer will invest* R* *in reliance and the seller will invest* X* *in precautions.*

*Remarks.* The intuition for this result is the following: by fixing the damages at a level independent of $R$, the buyer's incentive to manipulate the precaution level of the seller vanishes. This occurs even if the seller can observe the buyer's reliance level prior to choosing precautions. The buyer's return to his reliance investment accrues only when the contract is performed; hence, the buyer gives the correct consideration to the contingency of breach. Given that the buyer's equilibrium reliance is efficient, his expectation equals the hypothetical expectation set by the damage measure. Thus, the seller's cost of breach equals the social cost of breach, which leads the seller to take the optimal precautions.

Although the hypothetical expectation measure can lead to efficient behavior, its implementation poses practical difficulties. In applying the expectation or reliance measures, courts need only to observe the actual levels of $R$ or $V$ that the buyer claims. In applying the hypothetical expectation measure, courts need to be able to infer the underlying value function $V(.)$ and precaution function $P(.)$. As these informational requirements become costlier to satisfy, the practicality of the hypothetical expectation measure fades.

PROOF: Given that the buyer's objective is to choose $R$ so as to maximize $V(R)P(X) - R$, his choice function is $R^*(X)$—as defined in expression (4). And, given that the seller's objective is to choose $X$ so as to maximize $V(R^*)P(X) - X$, his choice function is $X^*(R)$—as defined by expression (2). Thus, the equilibrium must satisfy $X^* = X^*(R^*)$ and $R^* = R^*(X^*)$, which are the conditions for social optimum. Q.E.D.

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[12]See Cooter (1985) and Spier and Whinston (1995).

## VI. Concluding Remarks

We have presented a framework for studying two remedies for inadvertant breach in a general setting, with particular regard for the timing of the precaution and the reliance decisions. In many settings, the cost of monitoring the precaution and reliance levels discourages contracts that directly specify these levels, so that damages that vary with these variables would be costly to implement. We have used the framework to examine how the two general rules of damages would substitute for specific contracts when breach of contract is inadvertant. Please refer to Table 1 for a summary of the buyer's and seller's expected returns in the various cases.[13]

TABLE 1. Net benefits under alternative remedies

| | *Optimal* | *Expectation measure* | *Reliance measure* | *Specific performance* |
|---|---|---|---|---|
| Seller | $V(R)P(X) - X$ | $-V(R) + V(R)P(X) - X$ | $-R + RP(X) - X$ | $-S + SP(X) - X$ |
| Buyer | $V(R)P(X) - R$ | $V(R) - R$ | observed reliance: $V(R) - R$<br>unobserved reliance: $[V(R) - R]P(X(R))$ | $V(R) - R$ |

Our analysis focussed on inadvertant breach of contract. To compare our results with those in the setting of deliberate breach, let us identify the seller's "precaution" in our context with the seller's "breach" decision in the setting of deliberate breach. Then, we find that several of the key results are similar. First, the expectation measure of damages is Pareto-superior to the reliance measure. Second, the expectation measure induces an efficient level of precaution, given the buyer's choice of reliance. The reliance, however, is excessive. Third, under the reliance measure, the seller invests too little in precaution, given the buyer's choice of reliance. Fourth, the reliance measure induces the buyer to choose a higher degree of reliance than under the expectation measure only if the seller observes the buyer's reliance before deciding on the level of precaution.

There are, however, two major differences between the settings of deliberate and inadvertant breach. Both of these imply that general damage rules such as the expectation and reliance measures have a relatively more important role in the setting of inadvertant breach.

One concerns the role for *ex post* renegotiation. In the setting of deliberate breach, there is always time for the seller and buyer to renegotiate and agree on an efficient action before the seller decides whether or not to breach. Intuitively, the scope for renegotiation can make up for inefficient damage rules, as has been emphasized in work by Shavell (1980, 1984), Rogerson (1984), Craswell (1988a), and Emons (1991). By contrast, when breach is inadvertant, the opportunity to renegotiate does not arise. Accordingly, general damage rules such as the expectation and reliance measures have a relatively more important role in such settings.

[13]The last column of Table 1 presents the expected returns under specific performance. We discuss this remedy below.

The other major difference between the settings of deliberate and inadvertant breach is the role for specific performance. As the *Security Stove* case suggests, a remedy of specific performance is less likely to be feasible in settings of inadvertant breach compared with the setting of deliberate breach. By the time the plaintiff commenced legal action, the exhibition was over and the damage was done. It was too late for the plaintiff to perform. Where specific performance is not feasible, contracting parties must rely more heavily on damage measures.

Even if specific performance is feasible, it is a Pareto-inferior remedy compared with the expectation measure. Under specific performance, the buyer is assured of $V(R)$, whether the seller breaches or does not; hence, the buyer maximizes $V(R) - R$, resulting in excessive reliance. Let the cost of specific performance to the seller be $S$, then the seller minimizes $X + [1 - P(X)]S$. Consider two cases: first, if $S \leq V(R)$, then with expectation damages, the seller would perform rather than pay damages; hence, this remedy has the same effect as specific performance. In the other case, $S > V(R)$, then specific performance would lead the seller to a higher degree of precaution than the level under expectation damages.

We have also compared the expectation and reliance measures to other general damage rules, such as the restitution measure or no damages. Under the restitution measure, the seller reimburses the buyer for the consideration he has given, namely the contractual price. We do not present these extensions because the results are substantially similar to those in Shavell (1980). In particular, we found that the restitution measure provides higher welfare than a rule of no damages, but that its comparison to the expectation measure yields ambiguous results, which are sensitive to the same parameters as identified by Shavell.

There are two directions in which the analysis of remedies for inadvertant breach can be extended. The first is to consider the impact of actions that the buyer could take to reduce the likelihood of (inadvertant) breach (Che and Chung (1999) call these "cooperative investments"). For instance, the buyer might alert the seller to precautions that he might take to avoid breach. Under the expectation measure, the buyer derives no benefit from such actions—the buyer receives $V(R)$ in any event. Under the reliance measure, the buyer will benefit by reducing the likelihood of breach, because in the event of breach, the buyer receives $R < V(R)$. In this case, the buyer will have an incentive to invest in such actions. We believe, that consistent with Che and Chung's (1999) analysis for the case of deliberate breach, the expectation measure is inferior to the reliance measure for inducing efficiency in cooperative investments.

Another natural extension is to consider biases that could arise from systematic errors by courts in measuring the reliance or the expectation interest. The relative cost of verifying the buyer's reliance *ex post*, in contrast to estimating his expectation losses, may either reinforce the expectation measure's superiority or frustrate it.[14]

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[14]See Shavell (1984) for a model that accounts for estimation errors in appraising the damaged interests.

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