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ABSTRACT

The effect of remedies for breach in cases in which breach results from a deliberate decision not to perform has been analyzed comprehensively. This paper seeks to provide such a comprehensive analysis for those cases in which breach is inadvertent rather than deliberate. For such cases, we fully analyze the effect of breach remedies on ex ante precaution (which, in turn, determines the probability of inadvertent breach), as well as on reliance decisions. The results of the analysis reinforce and generalize certain important conclusions concerning the superiority of the expectation measure over the reliance measure. The analysis demonstrates that neither the expectation measure nor the reliance measure of damages can implement optimal precautions and reliance. The expectation measure leads to excessive reliance, and the reliance measure leads to excessive reliance and sub-optimal precautions. The expectation measure, however, is shown to be Pareto-superior to the reliance measure. This result is robust under various informational assumptions.

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I. INTRODUCTION

Contracts may be breached either deliberately or inadvertently. While the deliberate breacher determines affirmatively not to perform and thus bear the aftermath of his decision, the inadvertent 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 situation may be typified by the case of *Peevyhouse v. Garland Coal and Mining Co.* (1963).[1] Plaintiffs leased a piece of land to defendant to mine coal; under the contract, 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 the expected increase in market value of the site due to the repair was only $300. Defendant breached.

In this case, performance would have been inefficient. The economic analysis of breach of contract focused upon such deliberate breach cases, and examined the effect of the various remedies on inducing efficient breaches. Shavell (1980, 1984) was the first to provide an examination of the effect of damage measures on the two behavioral decisions of the parties: the breach decision and the reliance decision.[2]

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

[2] Shavell's analysis has been extended by Rogerson (1984), Polinsky (1983), Leitzel (1989) and others.

By contrast, the situation of inadvertent 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, plaintiff planned to display an oil and gas burner at an exhibition in Atlantic City, but did not intend to sell it. 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 inadvertent since the breacher had no incentive to deliver the part late, nor did he realize any expenditure reduction due to 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 while there is no breach decision, there is a preliminary determination to how much effort to invest in precautions. The "potential breacher" may influence the likelihood of inadvertent breach by employing different degrees of precautions against non-performance.

The issue of remedies for inadvertent breach was first introduced in the economic literature by Kornhauser (1983). In additional valuable contributions, Cooter (1985) and Craswell

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

(1988a, 1988b, 1989) explored some of the topics that arise in our context. However, none of these analyses provided a full comparison of the performance of the standard damage measures -- the expectation and the reliance measures -- in the general setting in which both precaution and reliance decisions are made. Thus, the analytic results that were derived for the case of deliberate breach by Shavell and others have not been fully examined yet in the analysis of inadvertent breach.

We develop a framework for such general study of remedies for inadvertent breach, in which both the precaution and the reliance decisions are examined simultaneously. The analysis focuses on the two standard remedies: the expectation and the reliance measures of damages.[4] We establish that Shavell's conclusions about the efficacy of damage measures in the case of deliberate conduct largely hold also in the case of inadvertent breach.

Section II.A describes the framework of the analysis. We consider a sale transaction where the seller's actions affect the likelihood of non-performance, 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

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[4] Specific performance is normally infeasible in such cases. Since we look into general remedies, we ignore individually tailored solutions such as liquidated damages. In the closing section we comment about two other measures: restitution and no damages.

sequences of actions. Either the decisions about precaution and reliance are made simultaneously (i.e., the seller does not observe the level of reliance when choosing the level of care), or they are made sequentially (the precaution decision is made after observing the level of reliance). While this distinction did not play any significant role in the case of deliberate breach, we identify its importance in the present context.

Section II.B derives the socially optimal levels of precaution and reliance and sets the stage for the efficiency evaluation of the damage measures. Sections III and IV examine the parties' behavior under the expectation and the reliance measures, respectively. We show that expectation damages induce efficient levels of precautions but excessive reliance. Reliance damages lead to under-investment in precautions and excessive levels of reliance that exceed even the distortion that arises under the expectation measure. Specifically, if the reliance decision is observable by the promisor, the magnitudes of the distortions change. In this case, reliance will be even more excessive, while the precaution level will be closer to the optimum. Section IV.D compares the remedies and concludes that the expectation measure is Pareto-superior to the reliance measure. Finally, Section V offers some concluding remarks.

II. FRAMEWORK OF ANALYSIS

A. 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 inadvertent 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 $V' > 0$, $V'' < 0$, $\lim_{R \to 0} V' = \infty$, $V(0) > 0$. X and R are assumed to be chosen either simultaneously or sequentially, depending on whether the buyer's choice of R is observed by the seller when the seller makes his choice of X. We will demonstrate that several results depend on this distinction. Accordingly we have:

The case of observed reliance: when choosing X, seller has observed R, i.e., R is chosen earlier and is observable.[5]

The case of unobserved reliance: when choosing X, the seller has not observed R. Either R has not been chosen yet, or it has been chosen but is not observable.

It is assumed throughout that the magnitude of damage that the buyer incurs in the event of breach is known to the seller prior to his decision about X.[6] Further, we assume that the

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

[6] 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).

buyer and seller have rational expectations about each other's choices.[7] We do not allow the contract price to depend on reliance or effort, since we intend to consider how the general rules of damages motivate the reliance and effort decisions, and how efficiently they may replace specific agreements about contingent levels of reliance and effort. We assume that both buyer and seller are risk-neutral.

B. Optimal Levels of Precautions and Reliance

1. 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, minus the cost of these precautions. Optimal precautions are those that generate the highest net return for any given level of reliance. Expression (2) indicates the relation between the

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[7] Craswell (1989) analyzes breach where the parties do not have rational expectations.

actual level of R and the seller's optimal precautions, given this level of R. Notice that X^* rises with R (i.e., $dX^*(R)/dR > 0$): a higher R implies a higher $V(R)$ and a lower value for the right hand side of (2); accordingly, X^* must be higher, to preserve the equality. Intuitively, it is clear that 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.

2. Optimal Reliance

Let $R^*(X)$ denote the optimal level of R, given X. It must be the solution to

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

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.

3. *Social Optimum*

Let X^*, R^* be the (global) social optimum, i.e., the levels that maximize $V(R)P(X) - R - X$. They must 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. Notice, that 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 damages under the expectation measure. We now analyze the buyer's reliance and the seller's precaution.

A. 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 excessive level of reliance, i.e., $R^e > R^*$. In fact, $R^e > R^*(X)$ for any X.

Remarks. The intuitive explanation for this result is the following: while the optimal reliance level depends on the probability of non-performance -- the higher such probability, the lower is the optimal reliance level -- the buyer fails to account for this possibility when relying. The buyer does not care about $P(X)$ because he gets the same payoff -- $V(R^e)$ -- regardless of the contingency, thus he does not consider the possibility of non-performance in determining his reliance level. Consequently, he is driven to invest excessively in reliance.

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

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

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

B. 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. Breach occurs with probability $(1 - P(X))$. Hence, 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, since 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. Since $R^e > R^*$, then $X^e > X^*$. The reason for this excessive level of precaution is the following: the buyer, by choosing an excessive level of reliance, makes the breach contingency costlier for the seller, than it would have been under the optimal reliance. Therefore, the seller would increase 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, since he is able to deduce the precise R^e, from which -- he knows -- 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. Q.E.D.

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 analyze separately the two cases, namely, the case of observed reliance and the case of unobserved reliance.[8] The

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

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 level of reliance he either observes or anticipates.

A. Precautions

Denote by R_s the level of reliance that the seller expects (or observes) the buyer to take. X^r, the seller's choice of precautions under the reliance measure, would be a function of R_s. Since 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:

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

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. While 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, since 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 expression (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.

B. Reliance

Let R^r denote the buyer's choice of R. 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 $P(X^r)\ R + [1 - P(X]\ V(R) - R$. Thus, the buyer chooses R to maximize $[P(X^r(R))(V(R) - R)]$. Notice that the buyer earns no profit, nor does he stand to lose anything when breach occurs; therefore, his choice of R is relevant to his position only when there is performance. He maximizes this conditional payoff while taking into consideration his ability to affect the likelihood of performance. The two cases are distinguished by this last effect, i.e., whether or not the buyer's choice of R affects the likelihood of performance.

1. Case of Observed Reliance

Here, the seller's choice of precautions is a function of R, 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 expression (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 non-performance relatively more costly for the seller, since 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 -- since reliance is always "free" to him.

We established in Proposition 1 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 regime, the buyer fails to account for the possibility of non-performance and to discount the reliance level accordingly. But here there is another effect that was not present under the expectation measure regime: 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.[9] 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 proofQ.E.D.

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

2. Reliance Level is Not Observed

Here, the seller cannot condition his choice of X on R^r. Although in equilibrium, the value of R for which 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 looking at Propositions 4 and 5, it is clear that the reliance level would be greater in the case in which the seller can observe it, because only in this case can the buyer utilize his reliance strategy to manipulate the seller's precaution decision and 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.

C. Returning to 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

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

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, while 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, it should be noted why the "third case," in which the buyer observes the seller's precautions before relying, is redundant. The results in such a scenario would be identical to those in the case of unobserved reliance (the case of simultaneous moves). The reason for this stems from the buyer's inability to 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, thus he chooses R to maximize his performance-contingent payoff $[V(R)-R]$, without the ability to affect the likelihood of performance. As his strategies in both cases solve the same optimization problem, they are identical.

D. Comparing the Expectation and the Reliance Measures

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 many precautions. The reliance measure leads to the same reliance and precaution when the seller cannot observe the buyer's reliance when choosing precaution and higher levels of reliance and precaution when the seller can observe the buyer's reliance when choosing precaution. By contrast, when breach is deliberate, the reliance measure always induces greater reliance than the expectation measure (Shavell (1980)).

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

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

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 inadvertent, 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.[10] 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

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

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 which 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 requirement become costlier to satisfy, the desirability of the hypothetical expectation measure fades.

Proof. Given that the buyer's objective is to choose R 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 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.

VI. CONCLUDING REMARKS

We have presented a framework for studying two remedies for inadvertent breach in a general setting, in which both the precaution and the reliance decisions are determined endogenously. As we claimed earlier, 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 model to examine how the two general rules of damages would substitute for specific contracts when breach of contract is inadvertent.

The analysis here focussed on inadvertent breach of contract. To compare our results with those in the setting of deliberate breach, let us identify the "precaution" taken by the seller in our context with the "breach" decision of the seller 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.

There are, however, two major differences between the settings of inadvertent and deliberate breach. In a setting of deliberate breach, the reliance measure always induces the buyer to choose a higher degree of reliance than under the expectation measure. In a setting of inadvertent breach, this is true only if the seller observes the buyer's reliance before deciding on the level of precaution.

The second major difference concerns the role for ex-post renegotiation. In the setting of deliberate breach, there is always time for the seller and buyer to renegotiate the Pareto efficient action before the seller decides whether or not to breach. As shown by Shavell (1980, 1984), Rogerson (1984), and Craswell [1988a], the scope for renegotiation has a significant impact on the efficiency of the breach decision. By contrast, when breach is inadvertent, this opportunity does not arise. Accordingly, general damage rules such as the expectation and reliance measures have a relatively more important role in such settings.

There are several directions in which the analysis can be extended. The first is to compare the expectation and reliance measures to other general damage rules, such as the restitution measure[11] or no damages.[12]

Another natural extension is to consider biases that could arise from systematic estimation 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

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[11] The restitution measure maintains that the promisor reimburse the promisee for the consideration he has given, namely the contractual price.

[12] We do not present these extensions since 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.

his expectation losses, may either reinforce the expectation measure's superiority or frustrate it.[13]

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

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