Ex Ante versus Ex Post Expectation Damages: Does the "Lower of the Two" Approach Make Sense?

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Abstract

What information should courts utilize when assessing contract damages? Should they measure damages at the ex ante rationally foreseeable level (*ex ante expected damages*)? Or should they measure damages at the ex post level taking into account new information revealed after contracting (*ex post actual damages*)? This article shows that ex ante expectation damages are more efficient than ex post actual damages in a simple model of costly litigation for contract breach, where there are either costs of verifying the breach victim's ex post damages, or general litigation costs such as lawyer fees. (We also compare the American rule versus the English rule.) We find that courts should award foreseeable flat damages, rather than seeking ex post accuracy and awarding actual damages. Actual damages lead to distortions in the incentives to breach once we take the non-breaching party's decision of whether to litigate the breach as endogenous. Ex ante damages are more efficient not only because of its relatively low informational demand, but more importantly because of the insensitivity of parties' litigation decision to their ex post private information. Our results are robust to accounting for renegotiation. (**JEL Classifications:** K0, K12, D82, D86 **Key Words:** Breach of Contract, Asymmetric Information, Expectation Interest, Renegotiation)

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1. Introduction

A and B sign a contract. A breaches the contract. It turns out that B is happy about the breach, because the contract turned out to be a losing contract for her. Can B recover damages from A? On the one hand, A after all *breached* the contract and should pay the foreseeable damages to B. On the other hand, B ended up suffering *no loss*, in fact she may have even benefited from the breach!

The example challenges us to consider what information courts should utilize in assessing contract damages: should they measure damages at the ex ante rationally foreseeable level (*ex ante expected damages*), or should they measure damages at the ex post level, taking into account new information revealed after contracting (*ex post actual damages*)? Courts traditionally award the "lower of the two": if the foreseeable damages are lower than actual damages, courts limit the award to the foreseeable damages. This principle is embedded in the rule of *Hadley vs. Baxendale.* If in contrast the foreseeable damages are higher than actual damages, courts will award actual damages. This principle is embedded in the penalty doctrine for liquidated damages clauses and in the compensation principle, which encourages courts to seek accuracy in estimating damages in order for the promisee to recover the full amount, and *only* the full amount, reasonably necessary to make him or her whole.[1]

We argue that generally courts should abandon the "lower of the two" approach. Instead, they should usually ignore ex post information and commit to simply awarding ex ante expected damages. In the example above, B should recover damages foreseeable at the time A and B entered the contract even though her actual damages are zero (in fact negative!). We demonstrate this through a simple model of contract breach, accounting for litigation costs such as lawyer fees or costs associated with verifying the breach victim's ex post damages.

Our recommendation stems from two reasons: First, and somewhat obviously, coarse damages such as ex ante expectation damages have much lesser informational requirement, thus saving ex post costs associated with information collection and verification. Second, and more interestingly, ex post accurate damages induce self-selection among victims of breach with respect to

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[1] 24 Samuel Williston & Richard A. Lord, A Treatise on the Law of Contracts § 64:1 (4th ed. 2001); 22 Am. Jur. 2d *Damages* § 27 (1988); 25 C.J.S. *Damages* § 21. For cases which face the tension between ex ante expected damages and ex post actual damages see *Truitt v. Evangel Temple, Inc.* 486 A.2d 1169 (D.C. 1984) (court awarded no damages to a promisee who entered a contract later with better terms than the contract breached by promisor), *General Supply & Equipment Co., Inc. v. Phillips* 490 S.W.2d 913 (Tex. App. 1972) (Texas appellate court remanded a case because, inter alia, the jury did not take into account lower damages actually suffered when it determined the buyer's consequential damages). And see Bowlay Logging Ltd. v. Domtar Ltd. (B.C.C.A. 1982) (Canadian court refused to award high damages to the promise after promisor showed that the promise would have lost more had the promisor performed).

the decision of whether to litigate the breach. Low-valuation victims would choose to acquiesce since the ex post payoff from litigation for those victims would be negative. This self-selection under ex post damages leads to *truncated distribution of expected damages in litigation*, which in turn causes distortion in the breaching party's incentives to breach in the first place.

We reach this conclusion by *endogenizing* the non-breaching party's decision of whether to litigate in a simple model of buyer-seller contracting with costly litigation. The large volume of previous literature on comparative efficiency of contract remedies typically assumes an informational structure such that the breach victim will *always* sue for some remedy.[2] Yet this assumption does not account for the possibility that a privately informed, non-breaching party may choose not to file a lawsuit if the expected payoff from litigation is negative. In a simplified model without litigation cost, Avraham and Liu (2009, forthcoming) show that seeking accuracy in ex post damages assessment leads to distortions in the ex ante incentives to breach, once you take into account the breach victim's option to not sue. However, Avraham and Liu (2009) do not account for litigation costs either in terms of lawyer fees or costs associated with verifying the victim's actual loss. Litigation cost is characteristically an important factor affecting parties' decisions of whether to file a suit. Thus, in this article we ask whether courts should apply flat ex ante expectation damages instead of ex post actual damages that are adaptive to post-contracting information, after introducing positive litigation costs into the model. We show that even when accounting for verification cost and/or litigation cost, fixed ex ante expectation damages are still more efficient than ex post actual damages.[3] When courts and parties invest resources in establishing accurate ex post damages they actually cause distortions in the incentives to breach. This is in contrast to the old notion that accurate damages assessment in ex post induces more efficient ex ante behavior.[4] Moreover, our recommendation to award fixed ex ante damages *strengthens* when there is a need to incentivize the promisee to minimize her loss by seeking another partner. By guaranteeing her the ex ante expected damages courts avoid diluting her incentives to minimize her losses.

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[2] See, for example, Birmingham (1970), Barton (1972), Goetz and Scott (1977), Schwartz (1979), Ulen (1984), Shavell (1980, 1984, 2004), Miceli (2004), and Schwartz and Scott (2008), among many others. Edlin and Schwartz (2003) and Mahoney (2000) provide excellent surveys of this literature.

[3] The only exception is that under the English rule, when there is renegotiation and the litigation costs are sufficiently high relative to the expected trade surplus, actual damages may be more efficient in limited scenarios.

[4] Similar discussions about when to ignore ex-post actual harm have been discussed in the context of liquidated damages (when scholars criticized the penalty doctrine) as well as in torts (when scholars argued that a taxi driver who negligently caused a traffic accident which physically injured the passenger and caused her to miss her flight, only to discover it crashed, should still pay damages to the passenger although the passenger ended up being "happy" about the accident).

In the well-known case *Hadley vs. Baxendale*, the court argues that ex ante expectation damages efficiently motivate disclosure of pre-contractual private information.[5] In contrast, in our model parties to the contract have no private information at the contracting stage. The advantage of ex ante expectation damages over actual damages in our model emerges because ex ante damages have lower informational demand and actual damages distort incentives to breach due to the non-breaching party's option to *not* file a lawsuit. Ayres and Talley (1995) argue that untailored liability rules induce more credible signaling of private information in price bargaining, and thus facilitate more efficient trade. Scott and Triantis (2006) argue that the equilibrium contract formation depends on the relative informational advantages of contracting parties (at ex ante) versus of the court (at ex post). Our analysis instead focuses on the parties' endogenous decision of whether to litigate the breach, given the costs of litigation. In particular, we are assuming that parties have no informational advantage vis-a-vis the court at the contracting stage.

Spier (1994) and Kaplow and Shavell (1996) evaluate the incentive effect resulting from accuracy of damages assessment. They argue that more accurate damages assessment will motivate more efficient precaution efforts, but also may lead parties to over-devote resources to establish damages and complicate the settlement process. Conversely, we argue that more accurate ex post damages assessment actually distorts the breaching party's performance incentives.

Ben-Shahar and Bernstein (2000) find that in repeated transactions an aggrieved party may not file a suit if doing so requires disclosure of private information, thus hurting her future competitive position. In contrast, we show that even in one-shot transactions, the privately informed aggrieved party's option to not sue is embedded in any contract remedy. In a recent paper Adler (2008) provides an analysis of the potential benefit from allowing negative damages (paid by the non-breaching party to the breaching party) in contract law. Allowing for negative damages will strengthen the incentives to *not* sue. Our analysis takes the prohibition of negative damages as given, and then formally compares the efficiency of ex ante versus ex post expectation damages in a costly litigation environment.

The rest of the paper is organized as follows: In Section 2, we present a simple model of buyer-seller contracting with costly litigation. In Section 3, we compare the efficiency of ex ante versus ex post expectation damages for the case with positive verification cost. Then in Section 4, we account for parties' general litigation costs. For each remedy we analyze both cases with and

[5] See Ayres and Gertner (1989), Bebchuk and Shavell (1991), and Adler (1999).

without renegotiation, and we also compare the American rule with the English rule of litigation cost shifting for each case. In Section 5, we summarize our results and conclude. In Appendix 1, we provide a proof that the buyer's participation constraint in the seller's optimization problem is binding. In Appendices 2 to 4, we provide detailed specifications of equilibrium prices and expected joint payoffs under various regimes.

2. The Model

At Time 1 two risk neutral parties (Buyer B and Seller S) enter a contract with agreed price, p, for the sale of a single widget. The seller receives payment upon performance at Time 2. There is uncertainty at Time 1 regarding the value of the contract for both parties. Specifically, the seller's cost, $c \in [0, \bar{c}]$, is drawn from a distribution F with density f. $f(c) > 0, \forall c \in [0, \bar{c}]$; and $f(c) = 0, \forall c \notin [0, \bar{c}]$. The buyer's valuation, $v \in [0, \bar{v}]$, is drawn from a distribution G with density g. $g(v) > 0, \forall v \in [0, \bar{v}]$.; and $g(v) = 0, \forall v \notin [0, \bar{v}]$. The commonly known distributions $F(\cdot)$ and $G(\cdot)$ are independent, continuous and twice differentiable. Denote $\boldsymbol{\mu_c} \coloneqq \int_0^{\bar{c}} c dF(c)$, and $\boldsymbol{\mu_v} \coloneqq \int_0^{\bar{v}} v dG(v)$. Both $\bar{c}$ and $\bar{v}$ are finite, with $\bar{c} > \mu_v$, and $\bar{v} > \mu_c$. Between Time 1 and Time 2 both parties learn their private valuations and the seller decides whether to breach the contract. Each party's respective valuation is unobservable to the other party. We first assume that parties commit not to renegotiate the contract ex post; later we relax this assumption and allow for renegotiation at the litigation stage. If there is a breach at Time 2, then at Time 3 parties may litigate the case under the given remedy. In contrast to Avraham and Liu (2009), we assume that litigation is costly. There are either costs of verifying ex post damages (we call them verification costs), denoted by $\beta \in \mathbb{R}^+$, when the enforced remedy requires information about the victim's ex post damages; or there are general litigation costs, such as lawyer fees. We denote these general litigation costs by $l \in \mathbb{R}^+$. Figure 1 presents the time line.[6]

[6] You may wonder why parties contract at ex ante stage when neither has private information, and why they do not wait to write a contract until they learn more information. A rationale for the value of ex ante contracting is to avoid the efficiency loss stemming from asymmetric information which parties will face in interim contracting (contracting after they learn private information). For an example of comparing optimal ex ante contract and optimal interim contract, see Avraham and Liu (2004).

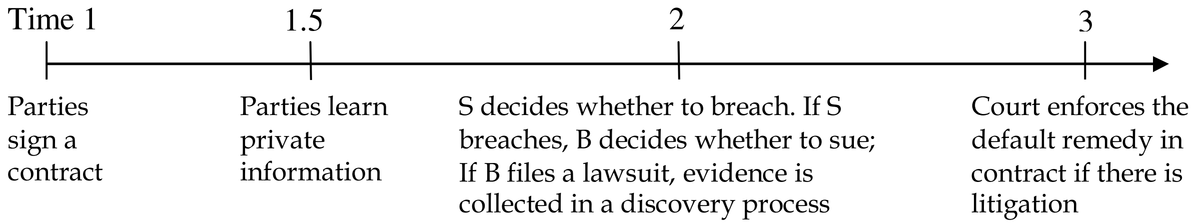

Figure 1 Time-line for the model

Without loss of generality, and for simplicity, we assume that the seller has full bargaining power. However, our results do not depend on this assumption.[7] We compare parties' joint expected payoff under ex ante versus ex post expectation damages. Under ex ante damages, courts commit to awarding fixed damages which were foreseeable at the ex ante stage, without incorporating new information revealed after that. Under ex post expectation damages courts seek ex post accuracy, assessing damages that are fully adaptive to the new information. To emphasize the difference between the two approaches, we assume that with some cost the buyer's valuation is verifiable to the court and thus actual damages can be completely assessed. In contrast, the seller's private information is unverifiable.[8] The following notations are used:

ED -- Ex ante expectation damages;

AD -- Ex post expectation damages, or actual damages;

$Br(\cdot)$ -- Seller's breach threshold under actual damages given his private information;

π_i^R ($R = ED$ or AD; $i = B$ or S) -- Party i's expected payoff under remedy R;

$j\pi^R$ -- Joint expected payoff under remedy R;

Subscript r -- the regime with renegotiation;

^ (~) at top of notations -- under the American (English) rule;

$\beta \in \mathbb{R}^+$ -- Cost of verifying ex post damages in litigation;

$l_i \in \mathbb{R}^+$ ($i = b$ or s) -- Parties' general litigation cost if they bring a lawsuit.

[7] For the general case of both parties sharing some bargaining power, the parties still maximize the joint expected payoff when writing the contract since no one has any private information at that stage. Thus, our basic results remain, and the change is the distribution of expected surplus between parties. Moreover, in our model we have no ex ante investment. If there is investment, the bargaining power assumption will affect the investment incentives (the "holdup" problem).

[8] Verifiable damages operationalize the ex post expectation damages remedy; otherwise the court needs to overcome the problem of asymmetric information and credibility of signaling. See Usman (2002), Sanchirico and Triantis (2008), and Bernardo, Talley and Welch (2000). On the other hand, if *both* parties' information were verifiable, it would have been trivial for the court to determine a first-best allocation, no matter what remedies the parties had contracted for.

3. Analysis of the Case with Positive Verification Cost

3.1 The Case of No Renegotiation

First, we assume that the parties commit to not renegotiating the contract after they learn new information.[9] For simplicity, in this section we assume that all litigation costs fall on verifying the buyer's ex post damages, if enforcing a remedy requires that information. We assume that the verification cost, β, is constant and does not depend on which party bears the cost. A natural implication of costly verification is that enforcing ex ante expectation damages is less costly than enforcing actual damages, because the former does not require verifying the ex post damages.

3.1.1 Ex Ante Expectation Damages

Under *Ex Ante Expectation Damages (ED)* the court commits to awarding fixed damages at the ex ante rationally foreseeable level (which is $\mu_v - p$ in our model), and does not adjust the damages award according to new information revealed in litigation. This remedy guarantees the victim of breach an expected payoff (calculated using *ex ante* commonly observed information) from contract performance. Notice that the equilibrium price under this remedy must be no greater than μ_v, otherwise the buyer's expected payoff from the seller's performance (or from litigation over breach), $\mu_v - p$, would be negative, and she will never sign such a contract. Thus, $p \leq \mu_v$, which implies that the buyer always sues upon breach. As a result, the seller breaches only if $c > \mu_v$. The seller's optimization problem is:

$$\max_p \pi_S^{ED} = \int_0^{\mu_v} (p - c)dF(c) + \int_{\mu_v}^{\bar{c}} (p - \mu_v)dF(c),$$

$$s.t.\ \pi_B^{ED} = \mu_v - p \geq 0.$$

Obviously, $p^{ED} = \mu_v$, and the joint expected payoff is:

$$j\pi^{ED} = \int_0^{\mu_v} (\mu_v - c)dF(c). \tag{1}$$

[9] Renegotiation has costs, especially when there is asymmetric information. Additionally, some contingencies may arise where one party needs to make the decision quickly, leaving no time for renegotiation. We analyze the case with renegotiation in section 3.2.

As it turns out, ED is also the welfare-maximizing *money* damages remedy.[10] To see this, suppose that in response to the court-imposed money damages, the seller's optimal breach threshold is x, i.e., he will breach when $c \geq x$. Then the joint expected payoff is $j\pi = \int_0^x (\mu_v - c) dF(c)$. An efficiency-oriented court will choose the money damages such that the induced breach threshold maximizes $j\pi$. Thus, $x^* = \mu_v$, which is exactly the breach threshold that ex ante expectation damages would induce. Therefore, among all *money* damages, ex ante expectation damages is the welfare-maximizing remedy.

We now turn to analyzing actual damages under both the American and the English rules.

3.1.2 Actual Damages

3.1.2.a The American Rule

Assume here that the default remedy in contract is ex post expectation damages, which we call *Actual Damages (AD).* This remedy compensates the victim of breach such that her *ex post* payoff would be as if the contract were performed. We first assume the American rule applies, which implies the plaintiff (B in our case) bears her own cost of verifying damages, β. Therefore, upon breach the buyer will sue for damages only if $v > p + \beta$. With probability $G(p + \beta)$, shown as the shaded area in Figure 2 below, buyers with low valuation of the good will not file a suit upon breach. Some of these buyers (with $v < p$) may in fact feel lucky the seller breached the contract as it saved them the obligation to pay for a good they do not value much. The other group of these low-valuation buyers (with $p < v \leq p + \beta$) does suffer some loss from breach, but the loss is not large enough to cover the cost of seeking damages through litigation. As shown in Figure 2, the buyers' self-selection in litigation decisions under actual damages leads to *a truncated distribution of potential damages in litigation*. If a suit if filed, the expected damages that a breaching seller faces in litigation are $E(v|v \geq p + \beta) - p$, which is the mean of the truncated damages distribution, and is obviously greater than the ex ante expectation damages, $\mu_v - p$.[11] The seller's payoff from

[10] Under money damages remedies, the breach of contract is irreversible. The only question is to determine the monetary compensation to the non-breaching party. In contrast, under non-money damages such as specific performance, the breach is reversible and the court could order performance of the contract.

[11] Of course, this does not directly imply that the seller's expected payoff from breach is smaller under AD than under ED, since on the other hand we have to consider the potential avoidance of damages under AD to those breach victims that do not sue. The breach thresholds under AD vs. under ED will be compared after we solve for the equilibrium price.

performance is $p - c$; while his expected payoff from breach is $\int_{p+\beta}^{\overline{v}}(p - v)dG(v)$. Therefore, the seller will breach if and only if:

$$c > p + \int_{p+\beta}^{\overline{v}}(v - p)dG(v) \coloneqq \widehat{\boldsymbol{Br}}(\boldsymbol{p}, \boldsymbol{\beta}). \quad (2)$$

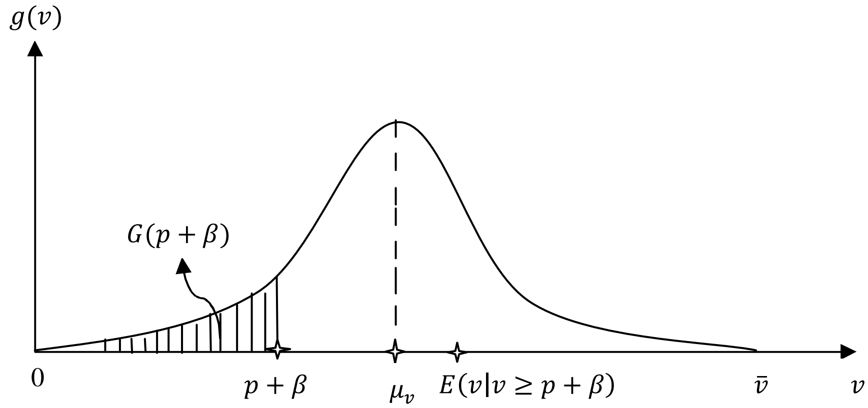

Figure 2 Truncated Distribution of Damages under Actual Damages and the American Rule

By the definition above we have $\widehat{Br}(p, \beta) > p$, which implies that the seller in some cases voluntarily performs even when performance is unprofitable. This may seem counter-intuitive since under the American rule the seller does not bear the cost of verifying the buyer's damages in case of a breach. Furthermore, as was just explained, there is a positive probability that the buyer would decide not to sue at all upon breach; thus, the seller might avoid paying damages altogether. The reason that the seller sometimes voluntarily performs at a loss is twofold: First, because under the American rule the buyer is less willing to challenge breach, the seller indeed can escape paying damages in some cases. However, in many of these cases (for buyers with $v < p$) the seller would have had to "pay" *negative* damages (had they been allowed). Thus, the seller is, in a way, worse off from the fact that those buyers do not sue. Second, in those cases in which the buyer *does* file a lawsuit the expected damages that the seller needs to pay are higher. These two features together characterize the truncated distribution of damages, which deters the seller from breaching, even under the American rule. Interestingly, as will be shown below, when we allow for renegotiation, this result changes. Specifically, we show that when there is renegotiation under actual damages and the American rule, the seller may *strategically breach (i.e. breach when performance is profitable) to extract surplus from the buyer.*

The seller's optimization problem is:

$$Max_p\ \hat{\pi}_S^{AD} = \int_0^{\widehat{Br}(p,\beta)}(p-c)dF(c) + \int_{\widehat{Br}(p,\beta)}^{\bar{c}}\int_{p+\beta}^{\bar{v}}(p-v)\,dG(v)dF(c)$$

$$s.t.\ \hat{\pi}_B^{AD} = \int_0^{\widehat{Br}(p,\beta)}(\mu_v-p)dF(c) + \int_{\widehat{Br}(p,\beta)}^{\bar{c}}\int_{p+\beta}^{\bar{v}}(v-p-\beta)dG(v)\,dF(c) \geq 0.$$

The Kuhn-Tucker conditions for the seller's optimization problem entail that in equilibrium the buyer's participation constraint must be binding, i.e., $\hat{\pi}_B^{AD}=0$. (The proof is in Appendix 1.) The equilibrium price and joint payoff are:

$$\hat{p}^{AD} = \mu_v + \frac{\left[1-F\left(\widehat{Br}(\hat{p}^{AD},\beta)\right)\right]\int_{\hat{p}^{AD}+\beta}^{\bar{v}}(v-\mu_v-\beta)dG(v)}{1-G(\hat{p}^{AD}+\beta)+F(\widehat{Br}(\hat{p}^{AD},\beta))G(\hat{p}^{AD}+\beta)}; \tag{3}$$

$$\widehat{J\pi}^{AD} = \int_0^{\widehat{Br}(\hat{p}^{AD},\beta)}(\mu_v-c)dF(c) - \beta\left[1-F\left(\widehat{Br}(\hat{p}^{AD},\beta)\right)\right][1-G(\hat{p}^{AD}+\beta)]. \tag{4}$$

We compare the breach thresholds induced by ED vs. by AD under the American rule:

$$\hat{\Delta}\boldsymbol{Br}(\boldsymbol{\beta}) := \widehat{Br}(\hat{p}^{AD},\beta) - \mu_v = \int_0^{\hat{p}^{AD}}(\hat{p}^{AD}-v)dG(v) - \int_{\hat{p}^{AD}}^{\hat{p}^{AD}+\beta}(v-\hat{p}^{AD})dG(v). \tag{5}$$

Denote β^* such that $\hat{\Delta}Br(\boldsymbol{\beta}^*) := 0$. In other words, given the equilibrium price under AD, when $\beta=\beta^*$, the breach threshold induced by AD is the same as the one induced by ED. It is easy to see that when $\beta \to 0$, $\hat{\Delta}Br(\beta) > 0$. That is, when the verification cost of assessing ex post damages is negligible, then as we have demonstrated in Avraham and Liu (2009), actual damages lead to under-breach --- from the ex ante perspective, the seller breaches less often than optimal, due to the buyer's self-selection with respect to the decision to litigate and the resulting truncated distribution of damages. When $\beta > \beta^*$, $\hat{\Delta}Br(\beta) < 0$, the seller breaches more often under AD than under ED. When $\beta < \beta^*$, $\hat{\Delta}Br(\beta) > 0$, the seller breaches less often under AD than under ED. This is quite intuitive: when the litigation cost for the buyer is high, the seller breaches more frequently because he rationally expects a higher chance of no suit being filed, as the high litigation cost deters low-valuation buyers from suing under the American rule; and vice versa. In contrast to Avraham and Liu (2009), the introduction of *verification cost under actual damages plays an interesting role in balancing two countervailing effects of breach victims' self-selection on the decision to litigate*. The first effect is the aforementioned truncated damages distribution effect, which increases expected damages payment conditional on a suit being filed, and thus weakens the seller's breach incentives. The other effect is the potential avoidance of liability to the low-valuation buyers (whose valuation is between p and $p+\beta$), which encourages the seller to breach. When there is no verification cost, as shown in Avraham and Liu (2009), the first effect dominates and the seller breaches less often than optimal under actual damages. But when there is positive verification cost, which of the two effects dominates depends on the magnitude of the verification cost. There exists a critical level of verification cost that distinguishes the cases where the truncated damages effect or the avoidance of liability effect dominates.

3.1.2.b The English Rule

We now assume the English Rule applies, which implies the breaching party (S) bears the verification cost, β. In that case, at Time 3 upon breach, the buyer will sue for damages if $v > p$. Hence, the seller's expected payoff from breach is $\int_p^{\overline{v}}(p - v - \beta)dG(v)$. Therefore he will breach if

$$c > p + \int_p^{\overline{v}}(v - p + \beta)dG(v) := \widetilde{\boldsymbol{Br}}(\boldsymbol{p}, \boldsymbol{\beta}). \tag{6}$$

From (6) we have $\widetilde{Br}(p, \beta) > p$, which implies that the seller in some cases voluntarily performs at a loss. The reason is twofold. First, as before, the truncation of damages distribution deters breach under actual damages. Second, under the English rule the breaching party bears the verification cost in litigation, which further discourages the incentives to breach.

As we did before, we now compare the breach thresholds induced by ED vs. by AD under the English rule: $\tilde{\Delta}\boldsymbol{Br}(\boldsymbol{\beta}) := \widetilde{Br}(p, \beta) - \mu_v = \int_0^p (p - v)dG(v) + \beta[1 - G(p)]$. It is easy to see that $\tilde{\Delta}Br(\beta) > 0$. Under the English rule, the seller breaches less often under AD than under ED, for the same reasons illustrated above. We have the following Lemma:

Lemma 1 *When verification of ex post damages is costly and parties commit to not renegotiate the contract ex post, under the American rule, the relative expected frequency of breach under AD versus under ED depends on the size of verification cost. There exists a critical level of verification cost, β^*, such that if $\beta = \beta^*$, the expected frequency of breach is the same under both remedies; if $\beta > \beta^*$, the seller breaches more often under AD than under ED; if $\beta < \beta^*$, the seller breaches less often under AD than under ED. Under the English rule, the expected frequency of breach is lower under AD than under ED, and this does not depend on the size of verification cost.*

As can be seen from Lemma 1, when there is litigation cost (in the current case, taking the form of cost of verifying damages), the truncation of damages distribution in litigation (see Figure 2) leads to under-breach when the English rule applies. However, in contrast to Avraham and Liu (2009), it does not necessarily lead to under-breach when the American rule applies; instead, the relative expected frequency of breach under AD vs. under ED depends on the size of the litigation cost. There exists a threshold level of verification cost (β^*) such that when the verification cost equals that level, the two remedies (AD and ED) induce the same expected frequency of breach. When the litigation cost is higher the seller breaches more often under AD (with the American rule) than under ED, as the high litigation costs induce more low-type buyers to choose to not sue. When the litigation cost is lower, the truncated damages distribution effect dominates and AD reduces the seller's incentives to breach (relative to the welfare-maximizing money damages, ED).

It can be shown that the buyer's participation constraint is binding, i.e., $\tilde{\pi}_B^{AD} = \int_0^{\widetilde{Br}(p,\beta)}(\mu_v - p)dF(c) + \int_{\widetilde{Br}(p,\beta)}^{\bar{c}}\int_p^{\bar{v}}(v-p)dG(v)\,dF(c) = 0$. The equilibrium price and joint surplus are:

$$\tilde{p}^{AD} = \mu_v + \frac{\left[1-F\left(\widetilde{Br}(\tilde{p}^{AD},\beta)\right)\right]\int_{\tilde{p}^{AD}}^{\bar{v}}(v-\mu_v)dG(v)}{1-G(\tilde{p}^{AD})+F(\widetilde{Br}(\tilde{p}^{AD},\beta))G(\tilde{p}^{AD})}; \tag{7}$$

$$\widetilde{J\pi}^{AD} = \int_0^{\widetilde{Br}(p,\beta)}(\mu_v - c)dF(c) - \beta\left[1-F\left(\widetilde{Br}(\tilde{p}^{AD},\beta)\right)\right][1-G(\tilde{p}^{AD})]. \tag{8}$$

The following proposition holds:

Proposition 1 *Assume that parties commit not to renegotiate the contract ex post, and that verifying buyer's ex post damages is costly. Then the following holds:*

(i) Ex ante expectation damages are more efficient than ex post actual damages, under both the English Rule and the American Rule.

(ii) Under actual damages (with either the English or the American Rule) the seller sometimes voluntarily performs at a loss.

(iii) The American rule is superior to the English rule under the actual damages remedy if:

$$\int_{\widetilde{Br}(\tilde{p}^{AD},\beta)}^{\widehat{Br}(\hat{p}^{AD},\beta)}(\mu_v - c)dF(c) \geq \beta\begin{Bmatrix}\left[1-F\left(\widehat{Br}(\hat{p}^{AD},\beta)\right)\right][1-G(\hat{p}^{AD}+\beta)] \\ -\left[1-F\left(\widetilde{Br}(\tilde{p}^{AD},\beta)\right)\right][1-G(\tilde{p}^{AD})]\end{Bmatrix}. \tag{9}$$

Proof. (*i*) Under the American rule, the difference between the joint expected payoffs under actual damages and ex ante expectation damages is:

$$\widehat{J\pi}^{AD} - \widehat{J\pi}^{ED} = \int_{\mu_v}^{\widehat{Br}(\hat{p}^{AD},\beta)} (\mu_v - c)dF(c) - \beta\left[1 - F\left(\widehat{Br}(\hat{p}^{AD},\beta)\right)\right][1 - G(\hat{p}^{AD} + \beta)] < 0,$$

since the first item is always negative, and the second item is always positive. We can prove for the case under the English rule in a similar way.

(*ii*) Follows from the fact that the breach thresholds under both rules are larger than the contracted price.

(*iii*) Follows from comparison of the expected joint payoffs.

ED is superior to AD. This is not only due to the deadweight loss embedded in the verification costs ($\beta > 0$) under actual damages, but also because the incentives to breach are further distorted relative to the ED remedy, which provides the best ex ante incentives to breach among all money damages remedies.

3.2 Accounting for Renegotiation

So far we have assumed that the parties can commit to not renegotiate the contract ex post. Now we relax this assumption and allow for renegotiation. Parties sign a contract with a default price, p, and anticipate that pre-trial renegotiation may take place after the discovery process in which the buyer's damages are revealed.[12] In the renegotiation, S (whom we assume has full bargaining power) makes a take-it-or-leave-it offer. If B accepts the offer, S is exempted from performing the original contract. If renegotiation breaks down, the court will enforce the default remedy. Figure 3 presents the time-line of the game with renegotiation:

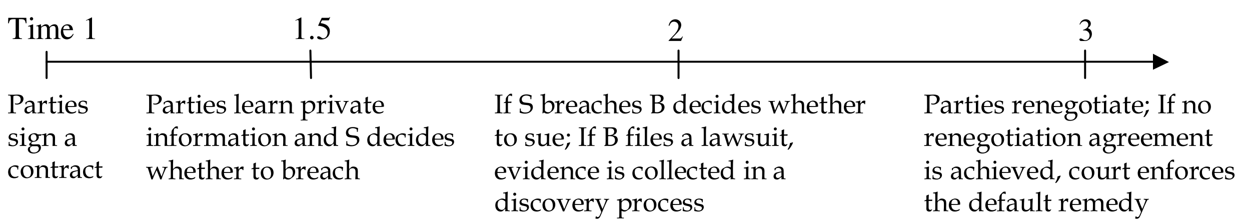

Figure 3 Time-line for the model with renegotiation

[12] There are many different assumptions one can make about the renegotiation game. For example, one may consider renegotiation before the discovery process in litigation. However, since the discovery process will unveil one party's private information, from the ex ante perspective, parties would prefer to renegotiate after discovery, because according to the bargaining theory (see, e.g., Stahl, 1972), bargaining with one-sided asymmetric information can lead to first best allocation if the party with private information makes the offer.

Given that the buyer's ex post damages are revealed through the discovery process, the seller's optimal renegotiation strategy is quite straightforward regardless of the contract remedy: If $v \geq c$, the seller will seek to trade at a price which guarantees the buyer her status quo payoff from trial. If $v < c$, the seller will seek to breach the contract, paying money damages to ensure the buyer obtains her status quo payoff from trial. Notice that, assuming the litigation occurs, this simple renegotiation scheme maximizes the ex post joint payoff.

The seller observes the buyer's ex post damages through the discovery process, but the verification of damages is only required when renegotiation fails and the court-enforced remedy requires knowing the buyer's ex post damages. In other words, discovery reveals actual damages, but does not necessarily verify them.[13] Therefore, if renegotiation fails, there is an extra cost to enforce actual damages due to the positive verification costs. However, positive verification costs have no impact on enforcing ex ante expectation damages that require no ex post information.

3.2.1 Ex Ante Expectation Damages with Renegotiation

At Time 3, given a lawsuit is filed, the buyer's valuation, v, will be revealed to all parties through the discovery process. At this point, the seller chooses a renegotiation strategy. B will accept an offer only if her guaranteed payoff is at least $\mu_v - p$, which is her status quo payoff from trial under ex ante expectation damages. S's optimal strategy is to renegotiate to trade at price $p - \mu_v + v$ when $v \geq c$; and to not make any renegotiation offer when $v < c$. Anticipating the strategies in Time 3, then back at Time 2, S *always* chooses to breach because his payoff from performance is $p - c$; while his expected payoff from breach is $\int_0^{min\,(c,\overline{v})}(p-\mu_v)dG(v) + \int_{min\,(c,\overline{v})}^{\overline{v}}(p-\mu_v+v-c)dG(v) = p - \mu_v + \int_{min\,(c,\overline{v})}^{\overline{v}}(v-c)dG(v)$, which is never smaller than $p - c$.[14] This implies that the seller sometimes *strategically breaches* (*breaches when performance is profitable*) *in order to take advantage of the litigation and renegotiation process to extract the buyer's private information and surplus*. The seller's optimization problem is:

$$Max_p \ \pi_S^{ED_r} = p - \mu_v + \int_0^{\overline{c}}\int_{min(c,\overline{v})}^{\overline{v}}(v-c)dG(v)\,dF(c)$$

[13] For simplicity, we assumed away the cost of discovery. Introducing a positive cost of discovery would have a consequence similar to the effect of introducing positive cost of verifying actual damages, which is analyzed in the text.

[14] $p - \mu_v + \int_{min\,(c,\overline{v})}^{\overline{v}}(v-c)dG(v) - (p-c) = \begin{cases} c - \mu_v > 0 & if\ c \geq \overline{v} \\ \int_0^c (c-v)dG(v) \geq 0 & if\ c < \overline{v} \end{cases}$.

$$s.t.\ \pi_B^{ED_r} = \mu_v - p \geq 0.$$

Obviously, $p^{ED_r} = \mu_v$, and the joint expected payoff is:

$$j\pi^{ED_r} = \int_0^{\overline{c}} \int_{min(c,\overline{v})}^{\overline{v}} (v-c) dG(v)\, dF(c). \tag{10}$$

The equilibrium price is the same as under ED with no renegotiation, but the joint payoff is increased with the opportunity to renegotiate. In fact, as can be seen from (10), *with post discovery renegotiation, ex ante expectation damages induce first best allocation.* Under the case of no renegotiation, ED is the best *money* damages remedy; while under the case with renegotiation, ED_r is the best remedy among *all* remedies, including money damages and specific performance.[15]

3.2.2 Actual Damages with Renegotiation

3.2.2.a The American Rule

Under the American Rule, the victim of breach bears her own cost of verifying ex post damages. At Time 3, S observes B's damages through the discovery process. In the renegotiation stage the buyer will accept an offer only if she is guaranteed a payoff of at least $v - p - \beta$, which is her payoff if she rejects the offer and proceeds to trial. As a result the seller's optimal strategy is to offer to trade at a higher price $p + \beta$ if $c \leq v + \beta$; and to not make any renegotiation offer otherwise. Anticipating the strategies at Time 3, the buyer will sue for damages at Time 2 only if $v > p + \beta$. Hence, S's expected payoff from breach is: $\int_{p+\beta}^{min\,(\overline{v},max\,(p+\beta,c-\beta))} (p-v) dG(v) + \int_{min\,(\overline{v},max\,(p+\beta,c-\beta))}^{\overline{v}} (p+\beta-c) dG(v)$. Therefore, the seller will breach when[16]:

$$c > p - [(1 - G(p+\beta))/G(p+\beta)]\, \beta \coloneqq \boldsymbol{\widehat{Br}_r(p, \beta)}. \tag{11}$$

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[15] First best will not be attained if there is a cost of discovery. However, the main result and implication are quite general even when discovery is costly. When the cost of discovery is small relative to the joint expected surplus from renegotiation, the seller is still motivated to strategically breach in order to extract the information and surplus through renegotiation.

[16] There are three cases: (1) $c < p + 2\beta$. In this case $c - \beta < p + \beta$, if the buyer sues upon breach (i.e., $v > p + \beta$), then $c - \beta < p + \beta < v$, the seller would offer to trade at price $p + \beta$, and his expected payoff from breach is $[1 - G(p+\beta)](p + \beta - c)$. Comparing this with his payoff from performance, $p - c$, the seller will breach only when $c > p - [(1 - G(p+\beta))/G(p+\beta)]\, \beta$. (2) $p + 2\beta \leq c < \overline{v} + \beta$. In this case $p + \beta \leq c - \beta < \overline{v}$. The seller's expected payoff from breach is $\int_{p+\beta}^{c-\beta} (p - v) dG(v) + \int_{c-\beta}^{\overline{v}} (p + \beta - c)\, dG(v)$. Comparing this with his payoff from performance, $p - c$, the seller will always breach in this region. (3) $c \geq \overline{v} + \beta$. In this case $c - \beta \geq \overline{v}$. The seller's expected payoff from breach is $\int_{p+\beta}^{\overline{v}} (p - v)\, dG(v)$. Comparing this with his payoff from performance, $p - c$, the seller will always breach in this region. Therefore, in sum, the seller will breach only if $c > p - [(1 - G(p+\beta))/G(p+\beta)]\, \beta$.

Since $\widehat{Br}_r(p,\beta) < p$, we conclude that the AD_r regime (under the American rule) sometimes induces strategic breach (i.e., breach when performance is profitable). The intuition is simple. With a strategic breach there is a positive probability the buyer will file a lawsuit, thus leading to disclosure of the buyer's private information through the discovery process in litigation. As a result the seller can extract some surplus from the buyer in renegotiation by taking advantage of the revealed private information. Furthermore, under the American rule the verification cost is borne by the buyer. Hence, breach may be more attractive to the seller than performance even when performance is profitable. This is in contrast with the case of no renegotiation, where AD induces voluntary performance at a loss in some cases.

Also, as can be seen from the description of the renegotiation strategies, under AD the renegotiation opportunity and the induced strategic breach do not lead to first best allocation, in contrast to the case under ED. Under AD, the verification cost, β, becomes a wedge thwarting efficient ex post allocation.

3.2.2.b The English Rule

Under the English rule the seller bears the verification cost. At Time 3 the buyer will accept an offer only if it guarantees her a payoff of at least $v - p$. Accordingly, the seller's optimal strategy at the renegotiation stage is to offer to trade at the original price p if $v \geq c - \beta$; and to breach and not make any renegotiation offer otherwise. Anticipating the litigation and renegotiation outcome in Time 3, the buyer in Time 2 will sue for damages only if $v > p$. So the seller's expected payoff from breach is: $\int_p^{max(c-\beta,p)}(p - v - \beta)dG(v) + \int_{max(c-\beta,p)}^{\overline{v}}(p - c)dG(v)$. Therefore, he will breach when $c > p \coloneqq \boldsymbol{\widetilde{Br}_r(p,\beta)}$.[17]

As can be seen from the above breach threshold, under AD_r with the English rule there is neither strategic breach nor strategic performance. This is in great contrast to the case with the American rule, and it is the result of two countervailing effects of breach: one is information disclosure via the discovery process, which allows the seller to take advantage of the renegotiation to

[17] There are three cases: (1) $c \leq p$. In this case $c - \beta < p$, if the buyer sues upon breach (i.e., $v > p$), then $c - \beta < p < v$, the seller would offer to trade, and his expected payoff from breach is $[1 - G(p)](p - c)$. Comparing this with his payoff from performance, $p - c$, the seller will always perform in this region. (2) $p < c < p + \beta$. In this case $c - \beta < p$, the seller's expected payoff from breach is $[1 - G(p)](p - c)$. Comparing this with his payoff from performance, $p - c$, the seller will always breach in this region (since now $p < c$). (3) $c \geq p + \beta$. In this case $c - \beta \geq p$. The seller's expected payoff from breach is $\int_p^{c-\beta}(p - v - \beta)dG(v) + \int_{c-\beta}^{\overline{v}}(p - c)dG(v)$. Comparing this with his payoff from performance, $p - c$, the seller will always breach in this region. Therefore, in sum, the seller will breach only if $c > p$.

extract surplus from the buyer; and the second effect is that the seller will now have to bear the verification cost if the buyer sues and the renegotiation breaks down. These two countervailing effects cancel each other out under AD_r with the English rule, so that the seller breaches if and only if performance is unprofitable. Additionally, as can be seen from the renegotiation strategies, under the English rule, the verification cost again handicaps a fully efficient ex post allocation under AD.

We have shown that *with renegotiation ED_r attains first best*. Therefore, $AD_r \prec ED_r$. (The equilibrium prices and joint payoffs under AD_r with either the American or the English rule are specified in Appendix 2.) The result is summarized in Proposition 2.

Proposition 2 *Assuming that parties may renegotiate the contract ex post and that verifying ex post damages is costly, the following holds:*

(i) ED_r is the first best remedy, unconditionally superior to AD_r;

(ii) The opportunity for renegotiation enhances efficiency when the default remedy for breach is ex ante expectation damages; in contrast, the opportunity to renegotiate may make the actual damages more or less efficient depending on the verification cost and valuation/cost distributions;

(iii) Under AD_r with the American rule, the seller sometimes strategically breaches in order to extract surplus from the buyer, while he does not do so under the English rule.

In sum, we have demonstrated that when verifying ex post damages is costly, both with and without renegotiation, courts would do better to stick to the fixed ex ante foreseeable expectation damages rather than seek ex post accuracy in determining damages.

4. Analysis of the Case with Litigation Cost

4.1 The Case of No Renegotiation

We now assume that the parties' litigation costs are l_b and l_s for the buyer and seller, respectively. For simplicity in this section we assume that there is no verification cost of ex post damages. The following notations are used (again, we use *hat (tilde) at top* to denote the American (English) rule):

ED^l -- Ex ante expectation damages with positive litigation cost; similarly, we denote actual damages as AD^l;

$Br^l(p)$ – The seller's breach threshold under actual damages with positive litigation cost, given price p.

4.1.1 Ex Ante Expectation Damages

4.1.1.a The American Rule

We first assume that the default remedy is ex ante expectation damages, and that parties do not renegotiate the contract ex post. When the American rule applies, each party bears his (her) own litigation cost. To solve for the equilibrium price under this regime, we consider two cases distinguished by the buyer's litigation decision upon breach. Case (1) $p > \mu_v - l_b$. In this case, since the buyer's payoff from litigation, $\mu_v - p - l_b$, is negative, she never sues upon breach. As a result, the seller breaches only if $c > p$. The seller's optimization problem in this price region (we denote the price in this region as $\hat{p}^{(1)}$) is:

$$Max_{\hat{p}^{(1)}}\ \hat{\pi}_S^{ED^l} = \int_0^{\hat{p}^{(1)}} \big(\hat{p}^{(1)} - c\big)dF(c),$$

$$s.t.\ \ \hat{\pi}_B^{ED^l} = \int_0^{\hat{p}^{(1)}} \big(\mu_v - \hat{p}^{(1)}\big)dF(c) \geq 0 \text{ and } \hat{p}^{(1)} > \mu_v - l_b.$$

Obviously, $\hat{p}^{(1)*} = \mu_v$, and the seller's expected payoff is $\hat{\pi}_S^{(1)} = \int_0^{\mu_v}(\mu_v - c)dF(c)$.

Case (2) $p \leq \mu_v - l_b$. In this case, since the buyer's payoff from litigation, $\mu_v - p - l_b$, is non-negative, she always sues upon breach. As a result, the seller breaches only if $c > \mu_v + l_s$. His optimization problem in this price region (denoted as $\hat{p}^{(2)}$) is:

$$Max_{\hat{p}^{(2)}}\ \hat{\pi}_S^{ED^l} = \int_0^{\mu_v + l_s} \big(\hat{p}^{(2)} - c\big)dF(c) + \int_{\mu_v + l_s}^{\bar{c}} \big(\hat{p}^{(2)} - \mu_v - l_s\big)dF(c),$$

$$s.t.\ \ \hat{\pi}_B^{ED^l} = \int_0^{\mu_v + l_s} \big(\mu_v - \hat{p}^{(2)}\big)dF(c) + \int_{\mu_v + l_s}^{\bar{c}} \big(\mu_v - \hat{p}^{(2)} - l_b\big)dF(c) \geq 0$$

$$\text{and } \ \hat{p}^{(2)} \leq \mu_v - l_b.$$

Obviously, in this region $\hat{p}^{(2)*} = \mu_v - l_b$, and the seller's expected payoff is $\hat{\pi}_S^{(2)} = \int_0^{\mu_v + l_s}(\mu_v - l_b - c)dF(c) - \int_{\mu_v + l_s}^{\bar{c}}(l_b + l_s)dF(c)$.

Clearly, $\hat{\pi}_S^{(1)} > \hat{\pi}_S^{(2)}$. Therefore, the optimal price $\hat{p}^{ED^l} = \mu_v$, and the joint expected payoff is:

$$\widehat{J\pi}^{ED^l} = \int_0^{\mu_v}(\mu_v - c)dF(c). \tag{12}$$

This is the same as the joint expected payoff under the optimal money damages in the case of no litigation cost, as was illustrated in Section 3.

4.1.1.b The English Rule

Now assume the English rule applies, so that S bears both parties' litigation costs. Similarly to the above, it can be shown that the joint expected payoff under the English rule is:

$$\widetilde{j\pi}^{ED^l} = \int_0^{\mu_v}(\mu_v - c)dF(c) = \widehat{j\pi}^{ED^l}. \qquad (13)$$

Therefore, under ex ante expectation damages with litigation costs, the equilibrium joint payoff is the same under both the English and the American rule.

We now compare ED with the welfare-maximizing money damages in the case with positive litigation costs. To determine the optimal court-imposed (money) damages, we assume that given some court-imposed damages, the buyer's optimal litigation threshold is y (i.e., she will sue upon breach only when $v \geq y$); while the seller's optimal breach threshold is x (i.e., he will breach when $c \geq x$). Then the joint expected payoff is $j\pi = \int_0^x(\mu_v - c)dF(c) - [1 - F(x)][1 - G(y)](l_b + l_s)$. The court will choose money damages such that the induced breach and litigation thresholds maximize the joint expected payoff. Simple analysis yields a solution: $x^* = \mu_v;\ y^* = \overline{v}$. As we showed above, ex ante expectation damages induce these decision thresholds precisely. Hence ED is also the optimal money damages remedy, under both the American and the English rules. In both cases the buyer never files a lawsuit, so parties do not incur litigation costs.

4.1.2 Actual Damages

We delegate to Appendix 3 a detailed specification of equilibrium under actual damages with positive litigation costs (when either the American or the English rule applies). Since ED are the welfare-maximizing money damages, as shown in section 4.1.1, they are superior to ex post actual damages. Proposition 3 summarizes:

Proposition 3 *Assuming that parties commit to not renegotiate the contract after learning new information, and that there are positive litigation costs, the following holds:*

i. ED are superior to AD under both the American rule and the English rule.

ii. ED are the welfare-maximizing money damages.

4.2 The Case with Renegotiation

We now assume that the parties may renegotiate the original contract, in the same way as in section 3.2. Our analysis yields that there is no clear-cut analytical solution to the comparison between the efficiency of the two remedies when there are positive litigation costs and renegotiation.[18] We therefore conduct a numerical analysis instead. We assume that the buyer's valuation is uniformly distributed between 0 and 1, and the seller's cost is uniformly distributed between 0 and a, where a runs from 0.5 to 1. First we fix $l_b = 0.125$, and let $l_s \sim U[0,0.25]$. Figure 4 shows the difference between the expected joint payoffs under ED_r and under AD_r when the American Rule (Figure 4(a)) or the English Rule (Figure 4(b)) applies. The y-axis represents a, the upper bound of S's cost distribution (which runs between 0.5 and 1). The x-axis represents l_s, the seller's litigation cost, (which runs uniformly between 0 and 0.25). The z-axis represents the difference in expected joint payoffs under the two remedies (ED_r and AD_r). (We do not present the other figure where we fix $l_s = 0.125$, and let $l_b \sim U[0,0.25]$.)

As can be seen from Figure 4, under the American rule with renegotiation the ex ante expectation damages remedy is more efficient than actual damages, even when litigation is costly. This is true even if the court can accurately assess the actual damages (without any verification costs). Under the English rule, ED_r is more efficient than AD_r, unless the litigation cost is sufficiently high relative to the expected trade surplus.

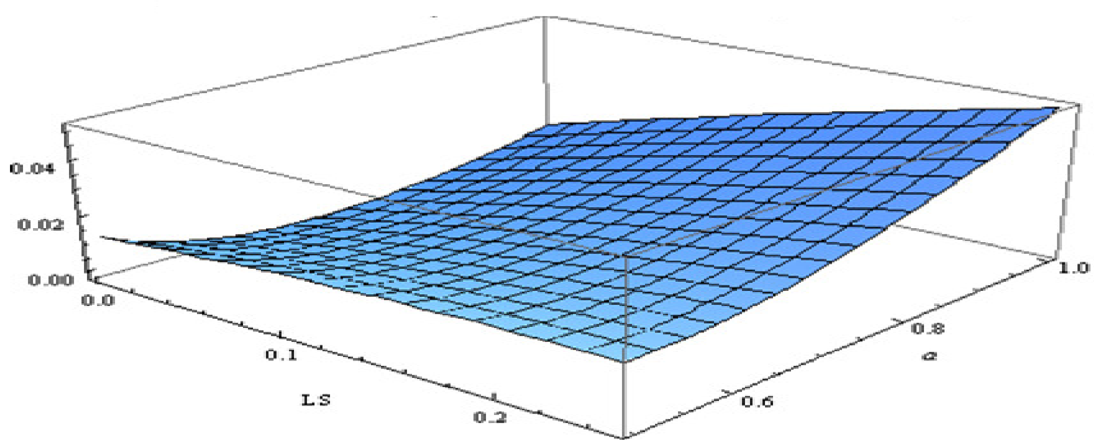

Figure 4(a) Difference in expected joint payoffs between ED_r and AD_r under the American rule

[18] The detailed specifications of equilibrium price and joint payoff in this case are delegated to Appendix 4.

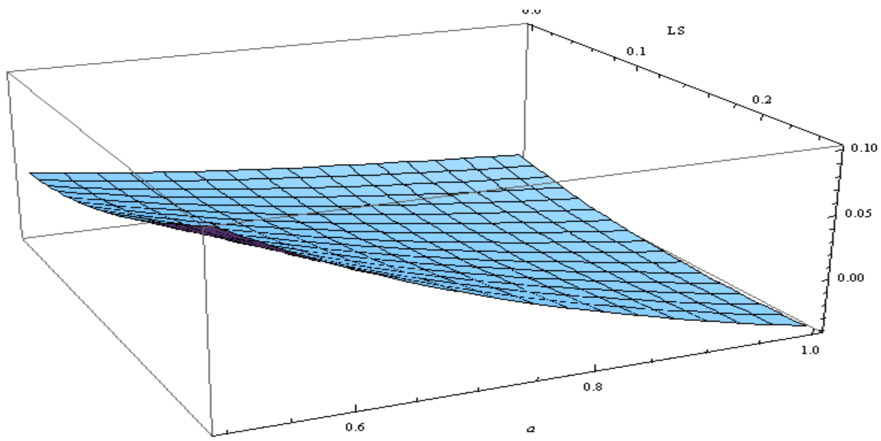

Figure 4(b) Difference in expected joint payoffs between ED_r and AD_r under the English rule

Figure 4 Numerical Comparison of ED_r and AD_r 's Efficiency under the American and the English rule

5. Conclusion

In an incomplete contract framework with post-contracting private information, we have shown that when litigation is costly (either because of costs of verifying ex post damages, or because of general litigation costs such as lawyer fees), ex ante expectation damages are almost always more efficient than ex post actual damages. As demonstrated, ex post accuracy in damages assessment does not help, but rather hinders the effort of motivating efficient incentives to breach. Therefore courts should commit to awarding fixed ex ante foreseeable expected damages, rather than seek accuracy by adapting damages to ex post information. Courts' approach of picking the lower of the ex post expectation damages and ex ante foreseeable expectation damages is not supported even when litigation costs, verification costs, and renegotiation are considered. Our recommendation to award foreseeable damages *strengthens* when there is a need to incentivize the promisee to minimize her harm by seeking another party to contract with.

One may wonder whether courts are able to handle the determination of the ex ante expectation damages. We believe they are. Arguably, proving fixed ex ante damages in court should not be much different from proving lost future profits. In both cases, courts are presented with evidence about the distribution of future damages. In the lost profits case, it is future damages vis-a-vis the time of breach; whereas in the fixed ex ante damages, it is future damages vis-a-vis the point of contracting. Considering that many courts allow recovery of lost future profits due to a breach in both established business cases (e.g., Denny Const., Inc. v. City and County of Denver, 2009) and in new business cases (e.g., Chung v, Kaonohi Center, 1980), truly calculating ex ante expectation damages should not prove too difficult a task.

Furthermore, other contract doctrines already employ the ex ante perspective, including in determining expectation damages. First, courts use the ex ante perspective when they enforce doctrines such as mistake, impossibility, and frustration. Second, when awarding actual ex post expectation damages, courts typically limit damages to the foreseeable results from a breach at the time the contract was made. Indeed, the ex ante damage calculation exercise is required in order to operationalize *Hadley v. Baxendale* (1854). Third, when reviewing liquidated damages clauses, courts are required, under the penalty doctrine, to limit these damages to the reasonable ex ante estimation of the non-breaching party's expectation interest.[19]

Against the backdrop of these fundamental, commonplace doctrines, the argument that courts are incapable of calculating ex ante expectation damages is unconvincing. In light of the gains in efficiency promoted by incentives under ex ante foreseeable damages, it is a task courts should be willing to undertake.

Appendices

Appendix 1. *Proof of Binding Constraint in Equilibrium under AD*

Proof. Let λ be the multiplier for the constraint.Then the Lagrangian for the seller's optimization program is $\mathcal{L} = \hat{\pi}_S^{AD} + \lambda \hat{\pi}_B^{AD}$. The first-order conditions are:

$$\mathcal{L}_p = (1-\lambda)F\left(\widehat{Br}(p,\beta)\right) + \left[1 - F\left(\widehat{Br}(p,\beta)\right)\right]\{(1-\lambda)[1-G(p+\beta)] + \beta g(p+\beta)\}$$
$$+\lambda f\left(\widehat{Br}(p,\beta)\right)\frac{\partial \widehat{Br}(p,\beta)}{\partial p}\left[\beta + \int_0^{p+\beta}(v-p-\beta)dG(v)\right] = 0; \quad \text{(A1)}$$

$$\mathcal{L}_\lambda = \hat{\pi}_B^{AD} = \int_0^{\widehat{Br}(p,\beta)}(\mu_v - p)dF(c) + \int_{\widehat{Br}(p,\beta)}^{\bar{c}}\int_{p+\beta}^{\bar{v}}(v-p-\beta)dG(v)\,dF(c) \geq 0; \quad \text{(A2)}$$

$$\lambda \geq 0;\ \lambda\mathcal{L}_\lambda = \lambda\hat{\pi}_B^{AD} = 0. \quad \text{(A3)}$$

[19] Indeed, since in our model there is no pre-contractual private information, the court's task of determining ex ante damages is no different from the contracting parties' task of writing a mutually agreed liquidated damages clause in the contract based on information commonly observed by the parties at ex ante stage.

We claim that the buyer's participation constraint is binding, i.e., her expected payoff is zero in equilibrium. Otherwise, $\hat{\pi}_B^{AD} > 0$, which implies $\lambda = 0$ by (A3). Then (A1) simplifies to $F\left(\widehat{Br}(p,\beta)\right) + \left[1 - F\left(\widehat{Br}(p,\beta)\right)\right][1 - G(p+\beta) + \beta g(p+\beta)] = 0.$. This is a contradiction since the left hand side is always positive. Therefore, we have

$$\hat{\pi}_B^{AD} = \int_0^{\widehat{Br}(p,\beta)} (\mu_v - p)dF(c) + \int_{\widehat{Br}(p,\beta)}^{\bar{c}} \int_{p+\beta}^{\bar{v}} (v - p - \beta)dG(v)\, dF(c) = 0.$$

Appendix 2. *Equilibrium Price and Expected Joint Payoff under Actual Damages with Renegotiation When Verification Is Costly*

3.2.2.a Under the American rule

The seller's optimization problem is:

$$Max_p\ \hat{\pi}_S^{AD_r} = \int_0^{\widehat{Br}_r(p,\beta)} (p - c)dF(c) + \int_{\widehat{Br}_r(p,\beta)}^{\bar{c}} \begin{bmatrix} \int_{p+\beta}^{min\,(\bar{v},max\,(p+\beta,c-\beta))} (p - v)dG(v) \\ + \int_{min\,(\bar{v},max\,(p+\beta,c-\beta))}^{\bar{v}} (p + \beta - c)dG(v) \end{bmatrix} dF(c)$$

$$s.t.\ \hat{\pi}_B^{AD_r} = \int_0^{\widehat{Br}_r(p,\beta)} (\mu_v - p)dF(c) + \int_{\widehat{Br}_r(p,\beta)}^{\bar{c}} \int_{p+\beta}^{\bar{v}} (v - p - \beta)dG(v)\, dF(c) \geq 0.$$

It can be shown that in equilibrium the constraint is binding and the price and joint surplus are given as follows:

$$\hat{p}^{AD_r} = \mu_v + \frac{\left[1 - F\left(\widehat{Br}_r(\hat{p}^{AD_r},\beta)\right)\right] \int_{\hat{p}^{AD_r}+\beta}^{\bar{v}} (v - \mu_v - \beta)dG(v)}{1 - G(\hat{p}^{AD_r}+\beta) + F(\widehat{Br}_r(\hat{p}^{AD_r},\beta))G(\hat{p}^{AD_r}+\beta)}; \tag{A4}$$

$$\begin{aligned} \widehat{J\pi}^{AD_r} &= \int_0^{\widehat{Br}_r(\hat{p}^{AD_r},\beta)} (\mu_v - c)dF(c) \\ &\quad + \int_{\widehat{Br}_r(\hat{p}^{AD_r},\beta)}^{\bar{c}} \begin{bmatrix} \int_{min(\bar{v},max(\hat{p}^{AD_r}+\beta,c-\beta))}^{\bar{v}} (v - c)dG(v) \\ - \int_{\hat{p}^{AD_r}+\beta}^{min(\bar{v},max(\hat{p}^{AD_r}+\beta,c-\beta))} \beta dG(v) \end{bmatrix} dF(c). \end{aligned} \tag{A5}$$

3.2.2b. Under the English rule

It can be shown that in equilibrium the buyer's participation constraint is binding, i.e., $\tilde{\pi}_B^{AD_r} = \int_0^p (\mu_v - c)dF(c) + \int_p^{\bar{c}} \int_p^{\bar{v}} (v - p)dG(v)\, dF(c) = 0$, and the price and expected joint surplus are:

$$\tilde{p}^{AD_r} = \mu_v + \frac{[1 - F(\tilde{p}^{AD_r})] \int_{\tilde{p}^{AD_r}}^{\bar{v}} (v - \mu_v)dG(v)}{1 - G(\tilde{p}^{AD_r}) + F(\tilde{p}^{AD_r})G(\tilde{p}^{AD_r})}; \tag{A6}$$

$$\widetilde{J\pi}^{AD_r} = \int_0^{\tilde{p}^{AD_r}} (\mu_v - c)dF(c) + \int_{\tilde{p}^{AD_r}}^{\bar{c}} \begin{bmatrix} \int_{min(\bar{v},max(c-\beta,p))}^{\bar{v}} (v-c)dG(v) \\ -\int_{\tilde{p}^{AD_r}}^{min(\bar{v},max(c-\beta,p))} \beta dG(v) \end{bmatrix} dF(c). \tag{A7}$$

Appendix 3. *Equilibrium Price and Expected Joint Payoff under Actual Damages When Litigation Is Costly and There Is No Renegotiation*

4.1.2.a Under the American rule

Here we assume the default remedy is actual damages, and that the American rule applies. Then at Time 3 if the seller breaches the contract, the buyer will sue only if $v > p + l_b$, so the seller's expected payoff from breach is: $\int_{p+l_b}^{\bar{v}} (p - v - l_s)dG(v)$. Therefore, he will breach when

$$c > p + \int_{p+l_b}^{\bar{v}} (v - p + l_s)dG(v) := \boldsymbol{\widehat{Br}^l(p)}.$$

It is obvious that $\widehat{Br}^l(p) > p$, which implies that the seller sometimes voluntarily delivers at a loss. The seller's optimization problem is:

$$Max_p\ \hat{\pi}_S^{AD^l} = \int_0^{\widehat{Br}^l(p)} (p-c)dF(c) + \int_{\widehat{Br}^l(p)}^{\bar{c}} \int_{p+l_b}^{\bar{v}} (p - v - l_s)dG(v)\, dF(c)$$

$$s.t.\ \hat{\pi}_B^{AD^l} = \int_0^{\widehat{Br}^l(p)} (\mu_v - p)dF(c) + \int_{\widehat{Br}^l(p)}^{\bar{c}} \int_{p+l_b}^{\bar{v}} (v - p - l_b)dG(v)\, dF(c) \geq 0.$$

In equilibrium the constraint is binding. The price and joint surplus are given in the following expressions:

$$\hat{p}^{AD^l} = \mu_v + \frac{\left[1-F\left(\widehat{Br}^l(\hat{p}^{AD^l})\right)\right]\int_{\hat{p}^{AD^l}+l_b}^{\bar{v}} (v-\mu_v-l_b)dG(v)}{1-G\left(\hat{p}^{AD^l}+l_b\right)+F(\widehat{Br}^l(\hat{p}^{AD^l}))G\left(\hat{p}^{AD^l}+l_b\right)}; \tag{A8}$$

$$\widehat{J\pi}^{AD^l} = \int_0^{\widehat{Br}^l(\hat{p}^{AD^l})} (\mu_v - c)dF(c) - \left[1 - F\left(\widehat{Br}^l\left(\hat{p}^{AD^l}\right)\right)\right]\left[1 - G(\hat{p}^{AD^l} + l_b)\right](l_b + l_s). \tag{A9}$$

4.1.2.b Under the English rule

Now assume that the English rule applies, hence S bears both parties' litigation costs. At Time 3 the buyer will sue for actual damages only if $v > p$, so the seller's expected payoff if he breaches is: $\int_p^{\bar{v}} (p - v - l_b - l_s)dG(v)$. Therefore, he will breach when

$$c > p + \int_p^{\bar{v}} (v - p + l_b + l_s)dG(v) := \boldsymbol{\widetilde{Br}^l(p)}.$$

It is obvious that $\widetilde{Br}^l(p) > p$, implying that the seller sometimes voluntarily delivers at a loss. It can be shown that the equilibrium price and joint surplus are the following:

$$\tilde{p}^{AD^l} = \mu_v + \frac{\left[1-F\left(\widetilde{Br}^l(\tilde{p}^{AD^l})\right)\right]\int_{\tilde{p}^{AD^l}}^{\overline{v}}(v-\mu_v)dG(v)}{1-G\left(\tilde{p}^{AD^l}\right)+F(\widetilde{Br}^l(\tilde{p}^{AD^l}))G\left(\tilde{p}^{AD^l}\right)}; \qquad \text{(A10)}$$

$$\widetilde{J\pi}^{AD^l} = \int_0^{\widetilde{Br}^l(\tilde{p}^{AD^l})}(\mu_v - c)dF(c) - \left[1 - F\left(\widetilde{Br}^l(\tilde{p}^{AD^l})\right)\right][1 - G(\tilde{p}^{AD^l})](l_b + l_s). \qquad \text{(A11)}$$

Appendix 4. *Equilibrium Prices and Joint Payoffs under Ex Ante Expectation Damages and Actual Damages When Litigation Is Costly and Parties May Renegotiate the Contract Ex Post*

For simplicity we will focus on the cases where $\overline{c} \leq \overline{v}$.

4.2.1 Ex Ante Expectation Damages with Renegotiation

4.2.1.a The American Rule

Now the default remedy is ex ante expectation damages. Parties may renegotiate the contract in ex post. First assume that the American rule applies. As we discussed before, there are two cases under this regime distinguished by the buyer's litigation decision upon breach:

Case (1) $p > \mu_v - l_b$. In this price region, as we have proven, $\hat{p}^{(1)*} = \mu_v$, and the seller's expected payoff is $\hat{\pi}_S^{(1)*} = \int_0^{\mu_v}(\mu_v - c)dF(c)$.

Case (2) $p \leq \mu_v - l_b$. In this case, since the buyer's payoff from litigation, $\mu_v - p - l_b$, is non-negative, she always sues upon breach. Given that the litigation costs are sunk at the renegotiation stage, the buyer will only accept an offer with guaranteed payoff at least $\mu_v - p$. Therefore, the seller's optimal renegotiation strategy is to offer to trade at price $p - \mu_v + v$ when $v \geq c$; and to not make any offer when $v < c$. Anticipating the strategies in Time 3, the seller at Time 2 chooses to breach when $\int_0^c (c - v)dG(v) > l_s$. [20] The left hand side of the inequality is the expected renegotiation surplus he can extract from the buyer, and the right hand side is the litigation cost. Denote:

$$\boldsymbol{\varphi(c)} := \int_0^c (c - v)dG(v) - l_s \qquad \text{(A12)}$$

and let $\varphi(\hat{\boldsymbol{c}}^*) = 0$. Obviously, $\varphi'(c) > 0$. Therefore, the seller breaches when $c > \hat{c}^*$. The seller's optimization problem in this price region (denoted as $\hat{p}^{(2)}$) is:

$$Max_p \ \hat{\pi}_S^{ED_r^l} = \int_0^{\hat{c}^*}(p - c)dF(c) + \int_{\hat{c}^*}^{\overline{c}}\begin{bmatrix} \int_0^c (p - \mu_v)dG(v) \\ + \int_c^{\overline{v}}(p - \mu_v + v - c)dG(v) - l_s \end{bmatrix} dF(c)$$

[20] Because his payoff from performance is $p - c$; while his expected payoff from breach is $\int_0^c (p - \mu_v)dG(v) + \int_c^{\overline{v}}(p - \mu_v + v - c)dG(v) - l_s = p - \mu_v + \int_c^{\overline{v}}(v - c)dG(v) - l_s$. He will breach when the payoff from breach exceeds the one from performance.

$$s.t.\ \hat{\pi}_B^{ED_r^l} = \int_0^{\hat{c}^*} (\mu_v - p)dF(c) + \int_{\hat{c}^*}^{\bar{c}} (\mu_v - p - l_b)dF(c) \geq 0 \text{ and } p \leq \mu_v - l_b.$$

Obviously, $\hat{p}^{(2)*} = \mu_v - l_b$. The seller's expected payoff in this price region is $\hat{\pi}_S^{(2)*} = \int_0^{\hat{c}^*} (\mu_v - l_b - c)dF(c) + \int_{\hat{c}^*}^{\bar{c}} \left[\int_c^{\bar{v}} (v - c)dG(v) - l_b - l_s\right] dF(c)$. The joint expected payoff is:

$$J\hat{\pi}^{ED_r^l} = max\left(\hat{\pi}_S^{(1)*}, \mathbf{1}_{\left\{\hat{\pi}_S^{(2)*} > \hat{\pi}_S^{(1)*}\right\}}\left[\hat{\pi}_S^{(2)*} + l_b F(\hat{c}^*)\right]\right), \tag{A13}$$

where the indicator function $\mathbf{1}_{\{\varphi\}} = 1$ if the statement φ is true, and 0 otherwise.

4.2.1.b The English Rule

Under ex ante expectation damages and the English rule, the equilibrium price must satisfy $p \leq \mu_v$. Otherwise, if $p > \mu_v$, the buyer's expected payoff would always be negative (either when the seller performs or when the seller breaches), and she would never have signed such a contract. Hence, given $p \leq \mu_v$, the buyer always sues upon breach and she will only accept a renegotiation offer with guaranteed payoff of at least $\mu_v - p$. The seller's optimal strategy is to offer to trade at price $p - \mu_v + v$ when $v \geq c$; and to not make any offer at the renegotiation stage when $v < c$. Anticipating the strategies at Time 3, the seller at Time 2 chooses to breach when $\int_0^c (c - v)dG(v) > l_b + l_s$.[21] The left hand side of this inequality is the expected renegotiation surplus he can extract from the buyer, and the right hand side is the seller's litigation cost. Denote:

$$\boldsymbol{\delta(c)} \coloneqq \int_0^c (c - v)dG(v) - l_b - l_s, \tag{A14}$$

and let $\delta(\boldsymbol{\tilde{c}^*}) = 0$.[22] Obviously, $\delta'(c) > 0$. Therefore, the seller breaches when $c > \tilde{c}^*$. The seller's optimization problem in this price region (denoted as $\tilde{p}^{(2)}$) is:

$$Max_p\ \tilde{\pi}_S^{ED_r^l} = \int_0^{\tilde{c}^*} (p - c)dF(c) + \int_{\tilde{c}^*}^{\bar{c}} \begin{bmatrix} \int_0^c (p - \mu_v)dG(v) \\ + \int_c^{\bar{v}} (p - \mu_v + v - c)dG(v) - l_b - l_s \end{bmatrix} dF(c)$$

$$s.t.\ \tilde{\pi}_B^{ED_r^l} = \mu_v - p \geq 0 \text{ and } p \leq \mu_v.$$

Obviously, $\tilde{p}^{(2)*} = \mu_v$. The joint expected payoff (which is the same as the seller's expected payoff) is:

[21] Because his payoff from performance is $p - c$; while his expected payoff from breach is $\int_0^c (p - \mu_v)dG(v) + \int_c^{\bar{v}} (p - \mu_v + v - c)dG(v) - l_b - l_s = p - \mu_v + \int_c^{\bar{v}} (v - c)dG(v) - l_b - l_s$. He will breach when the payoff from breach exceeds the one from performance.

[22] From the definitions it is straightforward to see that $\tilde{c}^* > \hat{c}^*$.

$$\widehat{J\pi}^{ED_r^l} = \int_0^{\tilde{c}^*}(\mu_v - c)dF(c) + \int_{\tilde{c}^*}^{\bar{c}}\left[\int_c^{\bar{v}}(v-c)dG(v) - l_b - l_s\right]dF(c). \tag{A15}$$

4.2.2 Actual Damages with Renegotiation

4.2.2.a The American Rule

Now the default remedy is actual damages. Parties may renegotiate the contract in ex post. First assume that the American rule applies. At Time 3 the buyer's damages are observed through the discovery process. She will accept an offer only if it guarantees her a payoff no less than $v - p$. Given this, the seller's optimal strategy is to renegotiate and offer delivery at price p when $v \geq c$; and to not make any offer when $v < c$. Anticipating the strategies in Time 3, the buyer will sue for damages upon breach at Time 2 only if $v > p + l_b$. The seller's payoff from performance is $p - c$; and his expected payoff if he breaches is: $\int_{p+l_b}^{max(c,p+l_b)}(p - v - l_s)dG(v) + \int_{max(c,p+l_b)}^{\bar{v}}(p - c - l_s)dG(v)$. Therefore, the seller will breach when

$$c > \frac{1}{G(max(c,p+l_b))}\left[\int_0^{p+l_b} pdG(v) + \int_{p+l_b}^{\bar{v}} l_s dG(v) + \int_{p+l_b}^{max(c,p+l_b)} vdG(v)\right] := \boldsymbol{\widehat{Br}_r^l(p)}. \tag{A16}$$

The seller's optimization problem is:

$$Max_p \ \hat{\pi}_S^{AD_r^l} = \int_0^{\widehat{Br}_r^l(p)}(p-c)dF(c) + \int_{\widehat{Br}_r^l(p)}^{\bar{c}}\begin{bmatrix}\int_{p+l_b}^{max(c,p+l_b)}(p - v - l_s)dG(v)\\ + \int_{max(c,p+l_b)}^{\bar{v}}(p - c - l_s)dG(v)\end{bmatrix}dF(c);$$

$$s.t.\ \hat{\pi}_B^{AD_r^l} = \int_0^{\widehat{Br}_r^l(p)}(\mu_v - p)dF(c) + \int_{\widehat{Br}_r^l(p)}^{\bar{c}}\int_{p+l_b}^{\bar{v}}(v - p - l_b)dG(v)\,dF(c) \geq 0.$$

It can be shown that the constraint is binding, and the equilibrium price and expected joint payoff are:

$$\hat{p}^{AD_r^l} = \mu_v + \frac{\left[1-F\left(\widehat{Br}_r^l\left(\hat{p}^{AD_r^l}\right)\right)\right]\int_{\hat{p}^{AD_r^l}+l_b}^{\bar{v}}(v-\mu_v-l_b)dG(v)}{1-G\left(\hat{p}^{AD_r^l}+l_b\right)+F(\widehat{Br}_r^l\left(\hat{p}^{AD_r^l}\right))G\left(\hat{p}^{AD_r^l}+l_b\right)} \tag{A17}$$

$$\widehat{J\pi}^{AD_r^l} = \int_0^{\widehat{Br}_r^l\left(\hat{p}^{AD_r^l}\right)}(\mu_v - c)dF(c) + \int_{\widehat{Br}_r^l\left(\hat{p}^{AD_r^l}\right)}^{\bar{c}}\int_{max\left(c,\hat{p}^{AD_r^l}+l_b\right)}^{\bar{v}}(v-c)dG(v)\,dF(c)$$
$$-\int_{\widehat{Br}_r^l\left(\hat{p}^{AD_r^l}\right)}^{\bar{c}}\int_{\hat{p}^{AD_r^l}+l_b}^{\bar{v}}(l_b + l_s)dG(v)\,dF(c). \tag{A18}$$

4.2.2.b The English Rule

We now analyze the case where the losing party (i.e., the seller) bears all the litigation costs. At the litigation stage the buyer will accept an offer only if her guaranteed payoff is at least $v - p$. Given this, the seller's optimal strategy is to offer to deliver at price p if $v \geq c$; and to not make any offer when $v < c$. Therefore, at Time 2 the buyer will sue upon breach only if $v > p$. As a result, the seller's expected payoff from breach is $\int_{p}^{max(c,p)}(p - v - l_b - l_s)dG(v) + \int_{max(c,p)}^{\overline{v}}(p - c - l_b - l_s)dG(v)$. Therefore, he will breach when

$$c > \frac{1}{G(max(c,p))}\left[\int_0^p pdG(v) + \int_p^{\overline{v}}(l_b + l_s)dG(v) + \int_p^{max(c,p)} vdG(v)\right] \coloneqq \boldsymbol{\widetilde{Br}_r^l(p)}. \quad \text{(A19)}$$

It can be shown that the equilibrium price and expected joint payoff are:

$$\tilde{p}^{AD_r^l} = \mu_v + \frac{\left[1-F\left(\widetilde{Br}_r^l\left(\tilde{p}^{AD_r^l}\right)\right)\right]\int_0^{\tilde{p}^{AD_r^l}}(\mu_v - v)dG(v)}{1-G\left(\tilde{p}^{AD_r^l}\right)+F\left(\widetilde{Br}_r^l\left(\tilde{p}^{AD_r^l}\right)\right)G\left(\tilde{p}^{AD_r^l}\right)}; \quad \text{(A20)}$$

$$\widetilde{J\pi}^{AD_r^l} = \int_0^{\widetilde{Br}_r^l\left(\tilde{p}^{AD_r^l}\right)}(\mu_v - c)dF(c) + \int_{\widetilde{Br}_r^l\left(\tilde{p}^{AD_r^l}\right)}^{\overline{c}}\int_c^{\overline{v}}(v - c)dG(v)\,dF(c)$$
$$- \int_{\widetilde{Br}_r^l\left(\tilde{p}^{AD_r^l}\right)}^{\overline{c}}\int_{\tilde{p}^{AD_r^l}}^{\overline{v}}(l_b + l_s)dG(v)\,dF(c). \quad \text{(A21)}$$

References

Adler, B. 1999. "The Questionable Ascent of Hadley v. Baxendale," *Stanford Law Review,* 51:1547-1590.

Adler, B. 2008. "Efficient Breach Theory Through the Looking Glass," *NYU Law Review*, 83:1679-1725.

Avraham, R., and Z. Liu. 2009. "Private Information and the Option to Not Sue: A Re-evaluation of Contract Remedies," forthcoming, *Journal of Law, Economics, & Organization*.

Avraham, R., and Z. Liu. 2006. "Incomplete Contracts with Asymmetric Information: Exclusive versus Optional Remedies," *American Law and Economics Review,* 8(3):523-561.

Avraham, R., and Z. Liu. 2004. "Sequential-Option Remedies for Contract Breach with Two-Sided Uncertainty and Asymmetric Information," Working Paper, Northwestern University.

Ayres, I. 2005. *Optional Law: The Structure of Legal Entitlements*. Chicago: Univ. of Chicago Press.

Ayres, I., and R. Gertner. 1989. "Filling Gaps in Incomplete Contracts: An Economic Theory of Default Rules," *Yale Law Journal*, 99(1):87-130.

Ayres, I. and E. Talley. 1995. "Solomonic Bargaining: Dividing a Legal Entitlement To Facilitate Coasean Trade," *Yale Law Journal*, 104:1027-1118.

Barton, J. 1972. "The Economic Basis of Damages for Breach of Contract," *Journal of Legal Studies,* 1: 277.

Bebchuk, L., and S. Shavell. 1991. "Information and the Scope of Liability for Breach of Contract: The Rule of Hadley v. Baxendale," *Journal of Law, Economics & Organization*, 7:284–312.

Ben-Shahar, O. and L. Bernstein. 2000. "The Secrecy Interest in Contract Law," *Yale Law Journal*, 109:1885.

Bernardo, A. E., E. Talley and I. Welch. 2000. “A theory of legal presumptions,” 16(1) *Journal of Law Economics, & Organization* 1-49.

Birmingham, R. 1969. “Breach of Contract, Damage Measures, and Economic Efficiency,” *Rutgers Law Review,* 24:273.

Brooks, R. 2006. “The Efficient Performance Hypothesis,” *Yale Law Journal*, 116:568.

Edlin, A., and A. Schwartz. 2003. “Optimal Penalties in Contracts,” *Chicago-Kent Law Review.*

Friedmann, D. 1989. “The Efficient Breach Fallacy,” *Journal of Legal Studies*, 18 (1):1–24.

Goetz, C. and R. Scott. 1977. “Liquidated Damages, Penalties and the Just Compensation Principle: Some Notes on an Enforcement Model and a Theory of Efficient Breach,” *Columbia Law Review,* 77:554.

Kaplow, L. 1994. “The Value of Accuracy in Adjudication: An Economic Analysis, *Journal of Legal Studies*, 23(1).

Kaplow, L. and S. Shavell. 1994. “Accuracy in the Determination of Liability,” *Journal of Law and Economics*, 37(1):1-15.

Kaplow, L. and S. Shavell. 1996. “Accuracy in the Assessment of Damages,” *Journal of Law and Economics*, 39(1): 191-210.

Mahoney, P. 2000. "Contract Remedies: General," in *The Encyclopedia of Law & Economics*.

Miceli, T. 2004. *The Economic Approach to Law*. Stanford, CA: Stanford University Press.

Sanchirico, C. W., and G. Triantis. 2008. “Evidentiary Arbitrage: The Fabrication of Evidence and the Verifiability of Contract Performance,” *Journal of Law, Economics, & Organization,* 24(1):72-94.

Schwartz, A. and R. Scott. 2008. “Market Damages, Efficient Contracting, and the Economic Waste Fallacy,” *Columbia Law Review,* 108:1610-1669.

Scott, R. E. and G. G. Triantis. 2006. “Anticipating Litigation in Contract Design,” *Yale Law Journal*, 115:814-879.

Shavell, S. 1980. “Damage Measures for Breach of Contract,” *Bell Journal of Economics,* 11:466-90.

Shavell, S. 1984. “The Design of Contracts and Remedies for Breach,” *Quarterly Journal of Economics,* 99(1):121-148.

Shavell, S. 2004. *Foundations of Economic Analysis of Law*. Cambridge, MA: Harvard University Press.

Spier, K. 1994. “Settlement Bargaining and the Design of Damage Awards,” *Journal of Law, Economics, & Organization,* 10: 84-95.

Stahl, I. 1972. *Bargaining Theory.* Economic Research Institute (EFI), Stockholm School of Economics.

Usman, K. 2002. “Verifiability and Contract Enforcement: A Model with Judicial Moral Hazard,” *Journal of Law, Economics, & Organization,* 18:67–94.