Breach Remedies, Performance Excuses, and Investment Incentives

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Abstract

The present paper investigates investment decisions generated by legal regimes that combine different breach remedies and performance excuses from contract law in a setting where investments are hidden actions and both costs and benefits from performance are of stochastic nature. The stochastically richer setting and the combination of remedies turns out to alter qualitatively some of the findings from the previous law and economics literature. Moreover, the analytical method propagated might also prove useful for applications beyond the topic of the present paper.

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1 Introduction

The economic analysis of law has a long tradition of investigating performance and investment incentives generated by contract law. The typical setting is one where parties have signed a simple, i.e. non-contingent contract which governs the interaction for some contingencies. For other contingencies, however, parties tacitly rely on default rules provided by contract law or they voluntarily engage in renegotiations.

Expectation damages, e.g., are known to provide efficient performance incentives for the promisor. Yet, as Shavell (1980) has formally established, expectation damages are generating excessive reliance incentives for the promisee. Specific performance also generates excessive reliance incentives even if parties renegotiate in those contingencies where performance happens to be inefficient, a classical result due to Rogerson (1984).

Much of this literature concentrates on one remedy in isolation. Yet, in practice, several remedies may come into play for one and the same case. Even if expectation damages are the basic remedy, the promisee may require restitution instead. Or the promisor may lounge an impracticability defense if performance would be unduly expensive for him.

The present paper investigates incentives under such a combination of remedies. While the focus will be on the interplay between expectation damages, restitution, impracticability defense and voluntary renegotiations, the analytic method introduced may prove useful for investigating other legal regimes as well.

Starting point for this work was a legal debate on the commercial impracticability doctrine as introduced by the 2002 reform of German obligation law.¹ To admit the defense, the promisor’s costs of performance must be “disproportionate” to the promisee’s benefits. The formulation of the provision remains vague. Worse, as Ackermann (2002) has pointed out, a literal interpretation of the provision would, in terms of the promisor’s payoff, be inconsistent with the less controversial physical impossibility defense.² He argues in favor of a more consistent interpretation according to which the

¹See German Civil Code § 275 II BGB. I am grateful to Johannes Köndgen for drawing my attention to the German debate on the impracticability doctrine.

²German Civil Code §275 I BGB.
impracticability defense should be admitted whenever the promisor’s costs
of performing exceed the price as specified in the contract. Put differently,
while Köndgen (2008) requires performance to be excused when performance
turns out to be inefficient, Ackermann argues in favor of the excuse being
admitted if performance fails to be profitable.

Impracticability defenses are known in other legal systems as well. In
fact, Ben-Shahar and Porat (2009) have edited a symposium volume of the
Michigan Law Review on fault in American contract law. In this volume,
Eric Posner (2009) deals with the issue from a common law perspective where
contract law is usually perceived as a strict liability system. When a promisor
fails to perform, he is held liable for the harm caused by his failure to perform
even if the promisor is without fault and even if circumstances have made
the contract more burdensome than anticipated.

Occasionally, however, if an unusual contingency has arisen as a conse-
quence of which the promisor is facing a dire constraint he may be excused
from performing. In practice, performance is excused only when it is ex-
tremely costly. Moreover, courts may also examine whether the promisor
could have kept costs of performance low by taking reasonable precautions.
Nonetheless, defenses such as impracticability to perform import elements of
a fault-based system, known from tort law, to contract law as well.

Along these lines, Posner forcefully argues that the case for strict liability
for breach of contract is not particularly strong. He offers an interpretation
of the Restatement, § 261, full in line with a negligence regime, under which the
promisor is liable if (1) he fails to perform when performance is cost-justified,
or (2) he fails to perform and performance is not cost-justified only because
the promisor failed to take cost-justified precaution. Posner’s position is close
to the one that Köndgen had propagated for Germany.

The present paper investigates reliance and precaution incentives that
are generated under the two interpretations of the impracticability defense.
The setting is related to the one used by Edlin and Reichelstein (1996).
The promisor’s precaution investments affect the cost of performance, the
promisee’s reliance investments affect the benefits from performance, both in
a stochastic way. Investments are hidden actions and, for that reason, cannot
be contracted upon.

While Edlin and Reichelstein have considered continuous quantity choice,
the present paper sticks with the more traditional performance/nonperfor-
mance dichotomy of mainstream law and economics of contract law. Due to
the stochastic richness of our setting, however, any relation between costs of,
benefits and price for performance will occur with positive probability. If, in
addition, legal regimes are considered allowing parties to opt for alternative
remedies the analysis may become intricate and investment incentives may
be affected in unforeseen ways.

To cope with such difficulties, the present paper develops a method that
seems conductive to intuition as it exploits the nature of the externalities
arising from different legal regimes. If the promisee’s reliance investments
impose a negative externality on the promisor, reliance incentives will be ex-
cessive. Similarly, if the promisor’s precaution investments impose a positive
externality on the buyer then precaution incentives will be insufficient.

The nature of externalities is closely related to the monotonicity of a
party’s payoff as a function of the other party’s investment level. Since
monotonicity is preserved under the expectation operator, it often suffices
to investigate monotonicity at the level of contingencies such that explicit
integration can be dispensed with. This greatly simplifies the analysis and
supports the intuition behind proofs.

The main findings of the paper are as follows. First, adding the option to
restitute to the remedy of expectation damages turns out to distort precau-
tion incentives. This comes as a surprise as precaution incentives are known
to be efficient under expectation damages in isolation.

Second, a suitable non-contingent price for performance generates efficient
reliance incentives provided that the seller is excused from non-profitable per-
formance. If, however, performance is excused if inefficient, the overreliance
result remains valid.

Third, no matter whether performance is excused if inefficient or if not
profitable, precaution incentives also depend on the non-contingent price
for performance as contractually specified. Again non-contingent prices will
exist such that precaution incentives are efficient but they will be different
from the one that induces efficient reliance incentives. This result is due
to the stochastic richness of the general setting. In fact, if the benefit from
performance is a deterministic function of reliance investments (as assumed in
much of the earlier literature) then the legal regime of excusing non-profitable
performance allows to generate efficient reliance and precaution incentives at the same time.

The present paper rests on many contributions from the existing literature. An early investigation of performance excuses from the law and economics perspective is due to Posner and Rosenfield (1977) who suggest that discharge should be allowed where the promisor is the superior risk bearer. But they also mention the potential use of the impossibility doctrine to optimize reliance incentives. If courts discharge the promisor just in those cases where the promisee has behaved suboptimally such a legal practice would affect reliance incentives indeed. Notice, implementing the scheme under this interpretation of the doctrine would require courts to monitor efficient reliance investments of the promisee. The present paper, in contrast, concentrates on the case where investments are hidden actions that cannot be monitored.

Sykes (1990) also explores the conditions under which a discharge of contractual obligations is efficient following an event that makes performance impracticable. He examines the scope of the defense both as a risk-sharing device and a leverage against over-reliance. If both parties are risk-neutral, expectation damages as breach remedy if combined with a particular interpretation of the impracticability defense would generate first best reliance incentives. Yet, to implement the rule, courts again would have to determine efficient reliance investments accurately. Sykes concludes from his findings that the information necessary to identify the conditions in practice may be extraordinary difficult to explain.

Wagner (1995) offers a similar defense of the impossibility defense. He points out that this defense assigns some risk of loss to the promisee which may alleviate the effects from over-reliance. His setting, however, is not rich enough to discuss the effect of differences in the interpretation of the impracticability defense.

Some of the vast literature on the hold-up problem is also related to the topic of the present paper. Ohlendorf (2009), e.g., has recently shown for the Edlin and Reichelstein setting that – contrary to the initial conjecture by Edlin and Reichelstein – expectation damages allow to generate efficient investment incentives for both parties. Ohlendorf concentrates on expectation damages as a breach remedy in isolation.
Nöldeke and Schmidt (1995) have shown that simple option contracts which give the seller the right to take the delivery decision and specify payments depending on whether delivery takes place or not also allow to implement the first best solution. While their paper is a seminal contribution to what economists call contract theory, it is not an analysis of default rules as provided by contract law.

The present paper is organized as follows. Section 2 introduces a general setting of two-sided investments and it introduces the method of identifying investment incentives based on the involved externalities. In section 3, the method is applied to several legal regimes. Starting with expectation damages in isolation, the option to restitute is added before damages are combined with two alternatives of the performance excuse.

Section 4 deals with the case often studied in the previous literature where benefits are a deterministic function of reliance investments. Some nice results are shown to hold which are lost in the richer setting of the previous section.

In section 5, the method advanced by the present paper is used to examine efficient expectation damages as introduced by Cooter (1985). Due to the stochastic richness of our setting, the regime fails to provide efficient precaution incentives. Section 6 recalls a contingent scheme that would allow implementing the first best solution quite generally even if investments are hidden actions. This theoretically powerful scheme, however, does not seem reminiscent of any regime from legal practice. Section 7 concludes.

2 The model

The main findings of the paper are established within the following model of reliance and precaution investments. The promisee, also referred to as buyer, she or party B, decides on reliance investments \(r \in R\) whereas the promisor, also referred to as seller, he or party A, decides on precaution investments \(s \in S\). The sets \(R\) and \(S\) are assumed to be intervals of the real line.

If the seller fails to perform his alternative (expected) costs amount to \(C^n(s)\) and the buyer’s alternative (expected) benefits amount to \(V^n(r)\). The (additional) costs and benefits from performance are denoted by \(c\) and \(v\), respectively. Costs \(c\) are assumed to be distributed with distribution function
\( F(c, s) \), benefits \( v \) with distribution function \( G(v, r) \).

**Assumption:** If \( r \ < \ r' \) then \( G(v, r) \geq G(v, r') \) whereas if \( s \ < \ s' \) then \( F(c, s) \leq F(c, r') \).

Higher reliance investments are increasing the benefit from performance, higher precaution investments are decreasing the costs of performance in the sense of first order stochastic dominance. This assumption is standard and will be imposed throughout the paper.

Performance is efficient if the extra benefits exceed the extra costs, i.e. if \( v \geq c \). Expected (net) social welfare under efficient performance amounts to

\[
W(r, s) = E_{r,s} [\max(v - c, 0)] - H(r) - K(s)
\]

where \( H(r) = r - V^n(r) \) denotes reliance expenditures net of alternative benefits of the buyer and \( K(s) = s + C^n(s) \) denotes precaution expenditures plus alternative costs of the seller. \( E_{r,s} \) is the expectation operator with respect to \( v \) and \( c \) whose distributions depend on \( r \) and \( s \). First best investments solve

\[
(r^*, s^*) \in \arg \max_{r,s} W(r, s).
\]

The distribution of the surplus among parties depends on the contract and the legal regime in place as follows. At date 1 (ex ante), parties invest. Investments are hidden actions. At date 2 (ex post), costs and benefits \( (c, v) \) become known to the parties and verifiable in front of courts. Before the performance decision is taken, parties may renegotiate. The renegotiation surplus relative to the threat point is shared in fixed proportions \( \lambda > 0 \) and \( \mu > 0 \) among the seller and the buyer where \( \lambda + \mu = 1 \).

The threat point depends on the contract and the legal regime in place and corresponds to the subgame perfect equilibrium outcome of the following two-stage game in extensive form. At stage 1, the seller decides on performance. If he performs, the game ends. Otherwise, the buyer takes resort to the breach remedies that are available under the legal regime in place. Renegotiation payoffs of the seller and buyer are denoted by \( \alpha_i(c, v) \) and \( \beta_i(c, v) \) where \( i \) refers to the legal regime in place.

Renegotiations are assumed efficient and free of costs such that

\[
\alpha_i(c, v) + \beta_i(c, v) = \max(v - c, 0)
\]
holds for any contract and legal regime considered in the present paper.

Anticipating their renegotiation payoffs, parties have the incentive to invest in accordance with the Nash equilibrium of the investment game with payoff functions

\[ E_{r,s} \left[ \alpha_i(c,v) \right] - K(s) = A_i(r, s) - K(s) \]

and

\[ E_{r,s} \left[ \beta_i(c,v) \right] - H(r) = B_i(r, s) - H(r) \]

for the seller and the buyer, respectively.

For classifying reliance incentives, socially best reliance responses serve as reference point. Given the generality of our setting, socially best responses need not be unique. To cope with this fact, legal regime \(i\) is said to generate excessive reliance incentives if there exists a socially best response \(r^+ \in \arg \max_r W(r, s_i)\) that does not exceed \(r_i\), i.e. \(r^+ \leq r_i\). Similarly, legal regime \(i\) is said to generate insufficient reliance incentives if there exists a socially best response \(r^{++} \in \arg \max_r W(r, s_i)\) in the range \(r_i \leq r^{++}\). Notice, a regime may generate both excessive and insufficient reliance incentives. If it does and if the socially best response is unique then \(r^+ = r_i = r^{++}\) must hold.

Reliance incentives are called strictly excessive (strictly insufficient) if, for any socially best response \(r^+ \in \arg \max_r W(r, s_i)\), the inequality \(r^+ < r_i\) (\(r_i < r^+\), respectively) necessarily holds in the strict sense.

Investment incentives are closely related to externalities from investments. The buyer’s reliance investments impose a negative (positive) externality on the seller if the seller’s expected payoff \(A_i(r, s)\) as defined above is monotonically decreasing (increasing) with the level \(r\) of the buyer’s reliances. The nature of the externality may change with the range of reliance investments.

On intuitive grounds, it is obvious that negative externalities mean excessive investment incentives whereas positive externalities mean insufficient incentives. The following lemma captures such intuition in a precise way.

**Lemma 1** If the buyer’s reliance investments impose a negative externality on the seller in the range \([r_i, \infty)\) then reliance incentives have to be excessive. If reliance investments impose a positive externality on the seller in the range \([0, r_i]\) then reliance incentives must be insufficient.
**Proof.** Due to the Nash property,

\[ B_i(r, s_i) - H(r) \leq B_i(r_i, s_i) - H(r_i) \]

must hold for any investment level \( r \). Moreover, suppose that reliance investments from the range \([r_i, \infty)\) impose a negative externality on the seller. Then, for any \( r \) from this range, it follows that \( A_i(r_i, s_i) \geq A_i(r, s_i) \) and, hence, that

\[ W(r, s_i) \leq W(r_i, s_i) \]

must hold which, in turn, means that a socially best response exists in the range \( r^+ \leq r_i \). The first claim is established.

The second claim can be established analogously. ■

The above lemma captures the intuition for incentives that are excessive or insufficient in the weak sense. Strictly excessive or insufficient investment incentives are also quite easy to detect provided that the seller’s expected payoff is a differentiable function of reliance investments and equilibrium investments are positive, i.e. \( r_i > 0 \). In fact, suppose reliance investments impose a negative externality in the range \([r_i, \infty)\) and suppose that the partial derivative at \( r_i \) is strictly negative, i.e.

\[ \frac{\partial A_i(r_i, s_i)}{\partial r} < 0 \]

then reliance incentives must be strictly excessive. This claim is valid for the following reason.

Since \( r_i \) is the buyer’s best response the partial derivative of the buyer’s expected payoff vanishes at \( r_i \) and, hence,

\[ \frac{\partial W(r_i, s_i)}{\partial r} < 0 \]

must also hold. As a consequence, \( W(r, s_i) \) strictly exceeds \( W(r_i, s_i) \) for any \( r < r_i \) sufficiently close to \( r_i \). Therefore, none of the investments from the range \([r_i, \infty)\) can be a socially best response and reliance incentives are strictly excessive indeed.

Similarly, if reliance investments impose a positive externality in the range \([0, r_i]\) and if the partial derivative is strictly positive, i.e.

\[ \frac{\partial A_i(r_i, s_i)}{\partial r} > 0 \]

then reliance incentives must be strictly insufficient.
In any case, the nature of the involved externalities is holding the intuitive key for the corresponding investment incentives. Moreover, due to the assumed stochastic dominance, it suffices to check for the monotonicity of the seller’s renegotiation payoffs as a function of the buyer’s benefits from performance. The following lemma recalls this well-known result.

**Lemma 2** If the seller’s renegotiation payoff \( \alpha_i(c, v) \) is monotonically decreasing (increasing) in \( v \) then the seller’s expected payoff \( A_i(r, s) = E_{r,s}[\alpha_i(c, v)] \) is monotonically decreasing (increasing) in \( r \) and the buyer has excessive (insufficient, respectively) reliance incentives.\(^3\)

Precaution incentives can be classified along similar lines. The intuition based on the nature of externalities also carries over. Details need not be repeated here. For later reference, however, the following lemma summarizes the corresponding result.

**Lemma 3** If the buyer’s renegotiation payoff \( \beta_i(c, v) \) is monotonically decreasing (increasing) in the costs of performance \( c \) then the seller has insufficient (excessive, relatively) precaution incentives.

Notice the asymmetry in the above two lemmas which is due to the asymmetry in the stochastic dominance with respect to the distributions of costs \( c \) and benefits \( v \) from performance.

### 3 Combining remedies

In this section, the nature of externalities is examined for a series of legal regimes that combine breach remedies and performance excuses. Heavy use is made of the results from the previous section.

Some of the findings may seem obvious as they simply extend known results to a richer stochastic setting. Others are more surprising because either the stochastic richness or the combination of remedies alters previous results.

Throughout this section, following Shavell (1980), parties are assumed to having contractually agreed on a non-contingent obligation for the seller to

\(^3\)For a general proof of this result, the reader is referred to Proposition 8.1.2 in Ross (1983).
perform at a fixed price $p$. If the seller does not perform and is not excused, the buyer takes resort to one of the breach remedies available to her.

As a warm up and for further reference, the nature of externalities is first explored under expectation damages in isolation (legal regime $i = 0$). Whether the seller performs or not, the buyer always ends up with payoff $\beta_0(c, v) = v - p$ such that the seller becomes residual claimant. Therefore, the seller has efficient performance incentives leading to payoff

$$\alpha_0(c, v) = \max(v - c, 0) - (v - p) = \max(p - c, p - v).$$

Since the seller’s payoff is a decreasing function of the buyer’s benefits $v$ from performance, reliance investments impose a negative externality on the seller and, hence, the buyer has excessive reliance incentives as is well known from the literature and as follows in the present setting from lemma 2. Moreover, the buyer’s payoff is constant in the costs $c$ of performance and, hence, the seller has efficient precaution incentives as follows from lemma 3.

Legal regime $i = 1$ allows the buyer to opt for restitution. In fact, suppose a contingency $v < p$ has arisen where expectation damages in the sense of regime $i = 0$ would be negative. Then, in case of non-performance, the buyer would rather opt for restitution leaving both parties with zero payoffs. Anticipating this option, the seller threatens to perform if $c < p$ whereas he threatens not to perform if $p < c$. Therefore, if $c < p$ renegotiation payoffs amount to

$$\alpha_1(c, v) = p - c + \lambda \cdot \max(c - v, 0) \quad \text{and} \quad \beta_1(c, v) = v - p + \mu \cdot \max(c - v, 0)$$

whereas, if $p < c$, they amount to

$$\alpha_1(c, v) = \lambda \cdot \max(v - c, 0) \quad \text{and} \quad \beta_1(c, v) = \mu \cdot \max(v - c, 0)$$

for the seller and the buyer, respectively.

In contingencies $p < v$, however, the buyer would ask for expectation damages leaving seller and buyer with the same renegotiation payoffs as under legal regime $i = 0$.

Tables 1–4 below summarize renegotiation payoffs for the legal regimes of the present section in a way that makes monotonicity of renegotiation payoffs and the nature of externalities visible. As far as legal regime $i = 1$ is concerned, whether $p < c$ or $c < p$, the seller’s renegotiation payoff remains
decreasing in \( v \) and, according to lemma 2, the buyer still has excessive reliance incentives.

Yet, the buyer’s renegotiation payoff becomes increasing in \( c \) and, according to lemma 3, the seller faces excessive precaution incentives. Notice, while adding the option to restitute does not change the nature of reliance incentives, surprisingly enough, it very well alters the nature of precaution incentives.

Next, consider regime \( i = 2 \) which adds a performance excuse to the previous regime that is granted to the seller if performance fails to be inefficient, i.e. in contingencies \( v < c \). Under regime \( i = 2 \), the seller threatens to perform if \( c < p \) leading to renegotiation payoffs

\[
\alpha_2(c,v) = p - c + \lambda \cdot \max(c - v, 0) \quad \text{and} \quad \beta_2(c,v) = v - p + \mu \cdot \max(c - v, 0)
\]

whereas he threatens not to perform if \( p < c \) leading to renegotiation payoffs

\[
\alpha_2(c,v) = \lambda \cdot \max(v - c, 0) \quad \text{and} \quad \beta_2(c,v) = \mu \cdot \max(v - c, 0)
\]

as the seller would be excused from performance.

In contingencies \( c < v \), however, renegotiation payoffs are the same as under legal regime \( i = 1 \).

Renegotiation payoffs under legal regime \( i = 2 \) are also summarized in Tables 1 – 4 below and allow for the following conclusions. The seller’s renegotiation payoff remains decreasing in \( v \) and, according to lemma 2, the buyer still has excessive reliance incentives.

The major change concerns again precaution incentives. In fact, if \( p < v \) then the buyer’s renegotiation payoff becomes decreasing in \( c \) while it remains increasing in \( c \) if \( v < p \). As a consequence, for high prices \( p \), precaution incentives remain excessive whereas, for low prices, precaution incentives become insufficient. Therefore, under the premises of Berge’s theorem of the maximum at least, an intermediate price \( p = p_A \) would exist such that the seller has the incentive for precaution investments in accordance with the socially best precaution response.\(^4\)

\(^4\)For an exact statement and proof of Berge’s theorem, the reader may wish to consult Theorem 2.1 on p. 301 of de la Fuente (2000). In the present application, the theorem holds if the seller’s expected payoff is a concave function of precaution investments.
Legal regime $i = 3$, finally, differs from the previous one in terms of the performance excuse. The seller is now excused from performance in those contingencies where it would not be profitable for him to perform, i.e. if $p < c$. In such contingencies, he always threatens not to perform leading to renegotiation payoffs

$$\alpha_3(c, v) = \lambda \cdot \max(v - c, 0) \quad \text{and} \quad \beta_3(c, v) = \mu \cdot \max(v - c, 0)$$

whereas, if $c < p$, performance is never excused and renegotiation payoffs are the same as in legal regime $i = 1$.

The crucial change follows from the summary of the seller’s payoff in table 1 below. Due to renegotiations, the seller’s payoff becomes increasing in $v$ if $p < c$ while it remains decreasing if $c < p$. It then follows from lemma 2 that, for high prices, reliance incentives remain excessive whereas, for low prices, they become insufficient. For intermediate prices, the nature of the externality is ambiguous.

In any case, reliance incentives depend on the non-contingent price. Therefore, under the premises of Berge’s Theorem again, a non-contingent price $p = p_B$ must exist such that the buyer has the incentive to invest in accordance with the socially best reliance response.\(^5\) The following two propositions summarize the above findings.

**Proposition 1** (reliance incentives)

(i) Under legal regimes $i = 0, 1$ and $2$, the buyer’s reliance investments impose a negative externality on the seller and reliance incentives are excessive.

(ii) Under legal regime $i = 3$, the externality may become ambiguous. For low (high) values of the non-contingent price $p$, the buyer’s reliance investments impose a positive (negative) externality on the seller and reliance incentives are insufficient (excessive, respectively).

(iii) Under the premises of Berge’s theorem of the maximum, there exists an intermediate price $p_B$ such that the buyer has the incentive to invest in accordance with the socially best reliance response.

\(^5\)For the present application of Berge’s theorem, it is sufficient that the buyer’s expected payoff is a concave function of reliance investments.
The proof follows from the monotonicity of the seller’s renegotiation payoff as a function of the buyer’s benefits $v$ from performance. This payoff depends on the legal regime in place as summarized in the following two tables.

<table>
<thead>
<tr>
<th>$\alpha_0(c, v)$</th>
<th>$(v &lt; p &lt; c)$</th>
<th>$(p &lt; v &lt; c)$</th>
<th>$(p &lt; c &lt; v)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p - v$</td>
<td>$p - v$</td>
<td>$p - c$</td>
<td>decreasing in $v$</td>
</tr>
<tr>
<td>$\alpha_1(c, v)$</td>
<td>$0$</td>
<td>$p - v$</td>
<td>$p - c$</td>
</tr>
<tr>
<td>$\alpha_2(c, v)$</td>
<td>$0$</td>
<td>$0$</td>
<td>$p - c$</td>
</tr>
<tr>
<td>$\alpha_3(c, v)$</td>
<td>$0$</td>
<td>$0$</td>
<td>$\lambda \cdot (v - c)$</td>
</tr>
</tbody>
</table>

Table 1: seller’s renegotiation payoff if $p < c$

<table>
<thead>
<tr>
<th>$\alpha_0(c, v)$</th>
<th>$(v &lt; c &lt; p)$</th>
<th>$(c &lt; v &lt; p)$</th>
<th>$(c &lt; p &lt; v)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p - v$</td>
<td>$p - c$</td>
<td>$p - c$</td>
<td>decreasing in $v$</td>
</tr>
<tr>
<td>$\alpha_1(c, v)$</td>
<td>$p - c + \lambda \cdot (c - v)$</td>
<td>$p - c$</td>
<td>$p - c$</td>
</tr>
<tr>
<td>$\alpha_2(c, v)$</td>
<td>$p - c + \lambda \cdot (c - v)$</td>
<td>$p - c$</td>
<td>$p - c$</td>
</tr>
<tr>
<td>$\alpha_3(c, v)$</td>
<td>$p - c + \lambda \cdot (c - v)$</td>
<td>$p - c$</td>
<td>$p - c$</td>
</tr>
</tbody>
</table>

Table 2: seller’s renegotiation payoff if $c < p$

The monotonicity of the seller’s renegotiation payoff determines the nature of the externality which, in turn, affects the intensity of incentives. If the distribution functions are differentiable and allow for density functions then the seller’s payoff as expected ex ante can be obtained from integration by parts. For legal regime $i = 2$ e.g., the partial derivative of the seller’s expected payoff amounts to

$$\frac{\partial A_2(r, s)}{\partial r} = \lambda \int_0^p \int_0^c G_r(v, r) \cdot dv \cdot F_r(c, s) \cdot dc + \int_p^\infty (c - p) \cdot G_r(c, r) \cdot F_c(c, s) \cdot dc$$

as can be shown by a lengthy calculation. If stochastic dominance holds in the strict sense, i.e. $G_r(v, r) < 0$, then the above partial derivative is strictly negative which means, that reliance incentives will be strictly excessive under legal regime $i = 2$.

**Proposition 2 (precaution incentives)**

(i) Under legal regime $i = 0$, the seller becomes residual claimant and has efficient precaution incentives.

(ii) Under legal regime $i = 1$, the seller’s precaution investments impose a negative externality on the seller and precaution incentives are excessive.
(iii) Under legal regimes \( i = 2 \) and \( i = 3 \), the externality may become ambiguous. For low (high) values of \( p \), the seller’s precaution investments impose a positive (negative) externality on the buyer and, hence, precaution incentives are insufficient (excessive, respectively).

(iv) Under the premises of Berge’s theorem of the maximum, there exists an intermediate price \( p_A \) such that the seller has the incentive to invest in accordance with the socially best precaution response.

The proof as given above rests on the monotonicity of the buyer’s renegotiation payoff summarized by the following two tables.

<table>
<thead>
<tr>
<th>( c &lt; v &lt; p )</th>
<th>( v &lt; c &lt; p )</th>
<th>( v &lt; p &lt; c )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_0(c,v) )</td>
<td>( v - p )</td>
<td>( v - p )</td>
</tr>
<tr>
<td>( \beta_1(c,v) )</td>
<td>( v - p )</td>
<td>( v - p + \mu \cdot (c - v) )</td>
</tr>
<tr>
<td>( \beta_2(c,v) )</td>
<td>( v - p )</td>
<td>( v - p + \mu \cdot (c - v) )</td>
</tr>
<tr>
<td>( \beta_3(c,v) )</td>
<td>( v - p )</td>
<td>( v - p + \mu \cdot (c - v) )</td>
</tr>
</tbody>
</table>

Table 3: buyer’s renegotiation payoff if \( v < p \)

<table>
<thead>
<tr>
<th>( c &lt; p &lt; v )</th>
<th>( p &lt; c &lt; v )</th>
<th>( p &lt; v &lt; c )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_0(c,v) )</td>
<td>( v - p )</td>
<td>( v - p )</td>
</tr>
<tr>
<td>( \beta_1(c,v) )</td>
<td>( v - p )</td>
<td>( v - p )</td>
</tr>
<tr>
<td>( \beta_2(c,v) )</td>
<td>( v - p )</td>
<td>( v - p )</td>
</tr>
<tr>
<td>( \beta_3(c,v) )</td>
<td>( v - p )</td>
<td>( \mu \cdot (v - c) )</td>
</tr>
</tbody>
</table>

Table 4: buyer’s renegotiation payoff if \( p < v \)

If the distribution functions are differentiable, the buyer’s payoff as expected ex ante can be obtained from integration by parts. For later reference, the partial derivative under legal regime \( i = 3 \) is listed and amounts to

\[
\frac{\partial B_3(r, s)}{\partial s} = \int_p^\infty \left[ \lambda \cdot F_s(p, s) + \mu \cdot F_s(v, s) \right] \cdot \left[ 1 - G(v, r) \right] \cdot dv - \int_0^p \left[ \lambda \cdot F_s(p, s) + \mu \cdot F_s(v, s) \right] \cdot G(v, r) \cdot dv
\]

such that its sign depends on the price \( p \) of performance.

Due to the stochastic richness of the general setting, the prices \( p_A \) and \( p_B \) will (generically) be different such that even legal regime \( i = 3 \) does not generally support the first best solution. If, however, benefits from performance are a deterministic function of reliance investments, legal regime \( i = 3 \) allows implementing the first best solution as is shown in the next section.
4 Deterministic benefits

Since much of the earlier law and economics literature has concentrated on the case where only one of the parameters is stochastic, the present section examines legal regime $i = 3$ where the benefit $v = U(r)$ from performance is a deterministic, monotonically increasing function of reliance investments $r$. Let $(r^*, s^*)$ denote the first best investment levels (see (1)) and suppose parties have fixed the non-contingent price $p = U(r^*)$ for performance.

Reliance incentives are explored again in terms of the nature of the externality which the buyer’s reliance investments impose on the seller. Suppose, first, reliance investments are from the range $r < r^*$. Since the benefits are a deterministic function of reliance investments, $v < p$ necessarily must hold. It then follows from tables 1 (column 1 only remains relevant) and 2 that the seller’s renegotiation payoff $\alpha_i(c, v)$ is a decreasing function of $v$ and, hence, reliance investments impose a negative externality on the seller for the regimes $i = 1$, 2 and 3.

Suppose, second, that reliance investments are from the range $r^* < r$ such that $p < v$ must hold for sure. It follows from tables 1 and 2 (column 3 only remains relevant) that the seller’s renegotiation payoff $\alpha_i(c, v)$ is a decreasing function of $v$ under legal regimes $i = 1$ and 2 whereas, under legal regime $i = 3$, his payoff is an increasing function of $v$. Therefore, under legal regime $i = 3$, the buyer has the incentive to invest efficiently. Moreover, if the buyer invests efficiently, the benefits from performance are equal to the price, i.e. $p = V(r^*) = v$ such that the seller becomes residual claimant and, hence, must have the incentive to invest in accordance with efficient precaution investments, i.e. $s = s^*$.

To summarize, under legal regime $i = 3$, the first best solution emerges provided that benefits from performance are a deterministic function of reliance investments and parties have agreed on the non-contingent price $p = U(r^*)$ for performance.

Notice, under legal regimes $i = 1$ and 2, reliance investments impose a negative externality on the seller for any level of investments and, hence, reliance incentives remain excessive. In this sense, the performance excuse based on non profitability outperforms the one where performance is excused if inefficient.
5 Efficient expectation damages

In this section, the method propagated by the present paper is applied to the legal regime of efficient expectation damages as pioneered by Cooter (1985). Excessive reliance incentives aggravate the harm from non-performance. By putting a cap $V$ on damages, the regime can be interpreted as requiring the buyer to bear part of the harm herself, similar in spirit to contributory negligence. The existing literature has investigated efficient expectation damages for the case where the buyer’s benefit is a deterministic function $v = U(r)$ of reliance investments $r$. Since the cap is put at the level of efficient reliances, i.e. $V = U(r^*)$, the scheme is referred to as efficient expectation damages. One of the nice properties of this regime is lost if the dependence is of stochastic nature as I now want to show.

Details of the regime, referred to as $i = 4$, are as follows. If benefits from performance are below the cap, i.e. $v < V$, expectation damages are granted as usual such that renegotiation payoffs amount to $\alpha_4(c, v) = \alpha_0(c, v)$ and $\beta_4(c, v) = \beta_0(c, v)$. If, however, the benefits exceed the cap, i.e. in contingencies $V < v$, the seller owes damages $V$ to the buyer in case of non-performance and, hence, the seller threatens not to perform if and only if $V < c$. The following four table summarize renegotiation payoffs of the seller and the buyer along similar lines as in section 3.

<table>
<thead>
<tr>
<th>$\alpha_4(c, v)$</th>
<th>$v &lt; c &lt; V$</th>
<th>$c &lt; v &lt; V$</th>
<th>$c &lt; V &lt; v$</th>
<th>decreasing in $v$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p - v$</td>
<td>$p - c$</td>
<td>$p - c$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5: seller’s renegotiation payoff if $c < V$

<table>
<thead>
<tr>
<th>$\alpha_4(c, v)$</th>
<th>$v &lt; V &lt; c$</th>
<th>$V &lt; v &lt; c$</th>
<th>$V &lt; c &lt; v$</th>
<th>ambiguous in $v$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p - v$</td>
<td>$p - V$</td>
<td>$p - V + \lambda \cdot (v - c)$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6: seller’s renegotiation payoff if $V < c$

Based on these renegotiation payoffs, the following proposition on reliance incentives follows from Lemma 2 in a way that should be familiar by now.

**Proposition 3 (reliance incentives)**

(i) If the cap $V$ is high then the seller’s renegotiation payoff is decreasing in $v$, reliance investments impose a negative externality on the seller and reliance incentives are excessive.
(ii) If the cap is $V$ low then the seller’s renegotiation payoff is increasing in $v$, reliance investments impose a positive externality on the seller and reliance incentives are insufficient.

(iii) Under the premises of Berge’s theorem on the maximum, there exists an intermediate cap $V_B$ such that the buyer has the incentive to invest in accordance with first best reliance investments.

The first claim holds as table 5 only matters whereas the second claim holds as the second and third column of table 6 only matter.

The following tables serve to establish the next proposition.

<table>
<thead>
<tr>
<th></th>
<th>$c &lt; v &lt; V$</th>
<th>$v &lt; c &lt; V$</th>
<th>$v &lt; V &lt; c$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_4(c,v)$</td>
<td>$v - p$</td>
<td>$v - p$</td>
<td>constant in $c$</td>
</tr>
</tbody>
</table>

Table 7: buyer’s renegotiation payoff if $v < V$

<table>
<thead>
<tr>
<th></th>
<th>$c &lt; v &lt; V$</th>
<th>$V &lt; c &lt; v$</th>
<th>$V &lt; v &lt; c$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_4(c,v)$</td>
<td>$v - p$</td>
<td>$V - p + \mu \cdot (v - c)$</td>
<td>$V - p$</td>
</tr>
</tbody>
</table>

Table 8: buyer’s renegotiation payoff if $V < v$

**Proposition 4 (precaution incentives)**

The buyer’s renegotiation payoff is decreasing in $c$, precaution investments impose a positive externality on the buyer and precaution incentives are insufficient.

The proof follows from the monotonicity of the buyer’s renegotiation pay-off as a function of $c$. Notice that the legal regime of efficient expectation damages also fails to induce the first best solution if both costs and benefits from performance are of stochastic nature.

Due to proposition 4, however, the first best solution could be restored by introducing the negligence standard $s^*$ for precaution investments in the following sense. If the seller has kept the standard by investing $s \geq s^*$ then the cap $V$ applies as above whereas if he has not, i.e. $s < s^*$, then he owes expectation damages according to legal regime $i = 0$. Then the first best investments $(r^*, s^*)$ form a Nash equilibrium of the investment game provided that the cap $V_A$ of proposition 3 is imposed.

In fact, suppose, first, the seller has invested efficiently. Then efficient reliance investments are the buyer’s best response as follows from proposition
3 (iii). Suppose, second, that the buyer has invested efficiently. According to proposition 4, precaution investments impose a positive externality on the buyer in the range \( s \geq s^* \) whereas they impose a negative externality in the range \( s < s^* \) as follows from proposition 2. Therefore the seller has the incentive to invest efficiently such that \( s^* \) is his best response indeed.

Based on principles known from tort law, it may seem obvious that a negligence rule allows to restore efficiency. Nonetheless, one still has to check before jumping at this conclusion. For illustration, consider legal regime \( i = 3 \) from section 3. To ensure efficient reliance incentives the fixed price \( p_B \) should be chosen as in proposition 1 (iii). At this price, however, the partial derivative of the buyer’s expected payoff (c.f. (2)) may still be negative, i.e.

\[
\frac{\partial B_3(r^*, s^*)}{\partial s} < 0
\]

in which case precaution investments impose a negative externality at \( s^* \) even if the performance excuse were granted in the range \( s \geq s^* \) only. In this case, precaution incentives would remain excessive indeed even if a negligence standard for precaution investments were introduced. Therefore, negligence rules in contractual settings need not perform as smoothly as is familiar from tort law.

The present paper concentrates on investments which are hidden actions, an informational setting that does not allow enforcing investments standards. For this reason, negligence rules will not further be explored.

6 Implementing first best investments with a contingent scheme

It is well-known that a contingent scheme allows to implement the first best solution even if both costs and benefits from performance are of stochastic nature and investments are hidden action. For sake of completeness, let me adapt such a scheme to the present setting.

Following Rogerson (1992), the mechanism can be constructed as follows. Let \( x^*(c, v) \in \{0, 1\} \) denote the ex post efficient performance decision and specify payments

\[
p(v) = -E_{r^*} [c \cdot x^*(c, v)] \quad \text{and} \quad q(c) = E_{r^*} [v \cdot x^*(c, v)]
\]
which all are contingent but, under the informational setting considered in
the present paper, verifiable in front of courts. Since the scheme implements
the ex post efficient decision renegotiations can be dispensed with and the
seller’s and buyer’s payoffs amount to
\[ \alpha(c, v) = -c \cdot x^*(c, v) + q(c) - p(v) \]
and \[ \beta(c, v) = v \cdot x^*(c, v) + p(v) - q(c) \],
respectively.

Anticipating these payoffs, the seller’s payoff as expected ex ante amounts
to
\[ A(r, s) = -E_{r,s} [c \cdot x^*(c, v)] + E_s [q(c)] - E_r [p(v)] . \]
Suppose the buyer has invested efficiently. Then the seller’s expected payoff
will be equal to the social surplus \( W(r^*, s) \) up to terms that do not depend
on the seller’s precaution investments. Therefore, first best precaution in-
vestments are the seller’s best response to efficient reliance investments.

For reasons of symmetry, first best reliance investments are the buyer’s
best response to efficient precaution investments as well and, hence, the first
best solution \((r^*, s^*)\) forms a Nash equilibrium of the investment game indeed.

From a theoretical perspective, the above contingent scheme is a powerful
device as it implements the first best solution. Yet I am not aware of default
rules from contract law that would lead to this contingent scheme.

7 Conclusion

This paper considers a model of two-sided investments familiar from the
literature on the hold-up problem. This literature has begun blooming with
the seminal paper by Grossman and Hart (1986).

The law and economic literature started even earlier looking at such mod-
els. Shavell (1980), in fact, has introduced a hold-up setting to establish his
well-known over-reliance result. The literature following Shavell has pro-
duced results that have become common tenets of law and economics.

If benefits from performance are a deterministic function of reliance in-
vestments then Shavell’s over-reliance effect can be cured if expectation dam-
ages are combined with a performance excuse suitably defined. A shown in
the present paper, a simple contract is then sufficient to generate efficient
reliance and precaution incentives at the same time.
In the stochastically richer setting of our general model, two equally simple contracts exist that provide efficient reliance incentives and efficient precaution incentives, respectively. Yet, since these two contracts are different, the first best solution can no longer be implemented by one and the same contract, a fate shared by Cooter’s (1985) efficient expectation damages.

It is not just the stochastic richness but also the combination of breach remedies and performance excuses that alters earlier findings. While expectation damages in isolation generate efficient precaution incentives, these incentives become distorted if the promisee, in case of non-performance, is allowed to opt for restitution. Since, in many real cases, promisees are actually given such options it seems appropriate to take them explicitly into account.

Contract law provides a whole array of default rules. While it may be simpler and, hence, tempting to analyze each of them in isolation, the findings can be misleading if applied to a situation where rules act in concert. The analytical tool developed in the present paper exploits the relation between investment incentives and the nature of the involved externalities. It is left for future research to test the scope of this tool beyond the combinations that have been studied in the present paper.

8 References


