Chapter 4
Two-sided Asymmetric Information, Bilateral Self Reliance, Simple Incomplete Contracts: Whither the Legal Remedies

4.1 Introduction:

In this chapter we shall be presenting a model involving two-dimensional asymmetry (uncertainty) and bilateral selfish investments. To introduce the analysis, suppose that two risk-neutral parties come together to exchange a particular commodity in the future. Both the parties invest in their respective valuations and costs, which enhance the social surplus when the trade occurs. At the beginning, the parties know their respective distributions from which the values of the relevant parameters related to their valuations will be drawn. The parties individually learn the respective true valuations only after they invest, but these values are neither observable to the other party nor verifiable to the court, thus private information. The parties then will continue their venture if they can produce the commodity at a particular cost and exchange at a particular (predefined) price. Otherwise, dispute arises and they settle it in a court.

The present analysis deals with the question of whether the first-best outcome is possible (with or without the support of legal remedies), when investments undertaken in reliance by both the parties are unobservable and the good's value and cost are also private information (ex post). This problem is not trivial. Two distinct cases are identified. First,
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when there is a "gap" between the supports of the seller's cost and the buyer's valuation, and secondly, when there is "no-gap". In the gap case when it is a common knowledge between the parties that the gains from trade exist, contract theory says that the efficiency is attained quite trivially by a single-price mechanism: trade for sure at a price belongs to the gap. This is incentive compatible, since the outcome does not depend on the report. Besides that, it is individually rational also, as each party receives a nonnegative payoff in every realisation. (See, Ausubel, Crampton and Deneckere (March, 2001)). We thus concentrate on the non-trivial case where there is "no gap" between the supports of the seller's cost and the buyer's valuation. The bargaining among the parties does not conclude with the probability one after any finite number of periods. One basic question is whether the private information prevents the bargainers from reaping all possible gains from trade.

Myerson and Satterthwaite (1983)[MS hereafter] find that if there is a positive probability of the gains from trade, but if it is not common knowledge that the gains from trade exist, then no incentive compatible, individually rational (IR), budget balanced (BB) mechanism can be ex post efficient.

In the Groves-Clarke mechanism (similar to Vickrey's (1961) second price auction mechanism), both the buyer and the seller have the incentive to truthfully announce their valuations to the court. Indeed, this is the only scheme where the truth-telling is implementable as a dominant strategy (Green & Laffont (1979)). Despite this very attractive feature, the Groves-Clarke mechanisms are problematic because they do not provide a balanced budget (BB). The "basic" Groves mechanism generates an expected deficit. In other words, the "basic" Groves mechanism satisfies IR but violates BB, whenever the expected
gains from trade are positive. More general Groves mechanisms can try to finance the
deficit by taxing the agents, but IR limits the magnitude of those taxes. For example, when­ever the valuation \( v \) is higher than the cost \( c \), the court orders a transfer to the tune of \( v \) to the seller but only collects \( c \) from the buyer, implying that it must make up the difference. (Ausubel, Crampton and Deneckere, see supra).

Whenever there is some uncertainty about whether the trade is desirable, the ex post
efficient trade is impossible. Therefore, the private information is a compelling explana­tion for the frequent occurrence of bargaining breakdowns or costly delay. Inefficiencies
are the necessary consequences of the strong incentives for misrepresentation between the
bargainers, each holding certain private information.

However, it is by now well known that the ex post efficiency can be achieved in such a
problem with quasi-linear utilities, if the parties can write a comprehensive contract ex ante;
i.e., before they privately learn their types (see D’Aspremont and Gérard-Varet, 1979; and
Arrow, 1979). It has been shown by Konakayama, Mitsui and Watanabe (1986), Rogerson
(1992) and Hermalin and Katz (1993) that comprehensive contracts can implement the first
best even if the parties’ valuations are private information and the reliance investments are
of selfish types.

While the optimal contracts that induce the first-best trading under the bilateral asym­metry are often quite complicated, the real world contracts seem to be rather simple. Most
often the parties come up with a fixed-price incomplete contracts which are generally rene­gotiated later (if not prohibited by court). Hence, it is an interesting question to ask in this
case whether it is also possible to achieve the first best. Taking this route Schmitz (2002
b), using a mechanism design approach, demonstrates that the voluntary bargaining over a collective decision under asymmetric information may well lead to ex an post allocative efficiency as well as the ex ante efficient reliance if the default decision is non-trivial (and the parties valuations are symmetrically distributed). By a non-trivial default decision he argues that the parties merely specify an unconditional level of trade, \( q^o \in [0, 1] \); i.e. default decision is an interior choice. His work is motivated by the solutions to hold-up problems using simple contracts that just specify a threat-point for future negotiations, given that the parties are symmetrically informed (as was the case in chapter 1, also see Aghion, Dewatripont and Rey, 1990 and 1994, Chung, 1991, Nöldeke and Schmidt, 1995 and 1998, Edlin, 1996, and Edlin and Reichelstein, 1996). However, all these literatures are based on the premise that renegotiation can always exploit any inefficiency remaining after a contract has been written under a complete information setting. However this assumption does not seem compelling in an incomplete information setting. Any efficient renegotiation process must be \emph{interim individually rational}; that is, having observed his/her private information, each party must always expect to become at least as well off from participating in the renegotiation process as from not participating and enforcing the existing contract. Otherwise, in some instances the efficient breach opportunities will be lost. Accordingly, we can directly apply the theorem of MS and state the impossibility of efficient renegotiation. As a consequence, the ex post efficiency is still under question.

Therefore, instead of renegotiation, this chapter considers the standard breach mechanisms (that specify a fixed compensation to be paid by the contract breacher) following usual \emph{Sub-game Perfect Nash Equilibrium}. It begins with a standard analysis of the be-
havioural effects of restitution and reliance damages. It then proceeds to the application of expectation damage measures in a world where the courts are not perfectly informed about the parties' valuations of the contract. As mentioned earlier, when valuation problems are extreme, the courts may turn to assess the expectancy of the victim of breach in two ways – *a subjective method* and an *objective method*. We hereby provide a demonstration of this and analyse whether these solutions to the valuation problem alleviate or exacerbate the opportunistic behaviour by the parties.

We establish two important but competing results. First, the parties may deliberately use a high penalty as a liquidated damage to induce the efficient relation-specific investment, but which may not induce the ex post efficiency or augment the social welfare. Second, the optimal rule that can be chosen ex post by the court under the bilateral incomplete information corresponds to the 'expected expectation damage' rule that maximises the social welfare but induces an inefficient incentive to invest. These results complement the existing literature on the issue of optimal breach remedies, which has been so far concerned with the question of ex ante efficiency mainly, i.e. inducing a correct level of relationship-specific investment (reliance), when information is complete (and hence renegotiation is assumed to make the ex post outcome always efficient). [Cf, Shavell; Rogerson; Chung; Edlin & Reichelstein; and Edlin, Spier & Whinston (1995)].

Our results are also related to the work of Aghion and Bolton [1987] who consider endogenously determined breach remedies in a supplier-buyer relationship. The efficient breach is possible as a new supplier enters the market with a cost advantage, but it is shown that when the future entrant has some market power the buyer and the incumbent seller will
set a socially excessive level of penalty for breach, thereby reducing the likelihood of entry below the ex post efficient level.

4.1.1 Related Literature:

There are three types of literature that are closely related to the present analysis: the literature that addresses the efficiency of various contract remedies, the literature that compares the different information disclosure effects of these remedies, and finally the literature on the optimal accuracy of damages assessment.

Among the first type, there is a vast literature on the comparative advantage of various contract damages measures. For example, Birmingham (1970), Barton (1972), Goetz and Scott (1977), Shavell (1980, 1984), and Miceli (2004), among many others, have studied various damages measures for breach of contract and compared their efficiency. Edlin and Schwartz (2003) provide an excellent survey of this literature. Almost without exception these studies assume that the non-breaching party will always pursue a remedy for the contract breach regardless of her post-breach valuation. As a result, these studies ignore the endogenous option given to the non-breaching party to not litigate the case if her post-breach valuation is smaller than the contracted price. In contrast, our model incorporates the embedded option to rationally accede to a breach and demonstrates that this has important efficiency implications.

The second type of literature analyses the incentives to disclose private information that the various remedies provide (see Ayres and Gertner (1989); Bebchuk and Shavell (1991); and Adler (1999)). Bebchuk and Shavell (1991) exhibited that awarding expected
expectation damages by the court induces better information disclosure at the contracting stage from the privately informed party and thus makes the estimation of expectation damage more accurate, leading to more efficient breach decisions. In contrast, we deal with a framework where the parties to the contract have no private information at the contracting stage, thus no information disclosure incentives need to be created at that stage. The advantage of expected expectation damages over actual damages in our model emerges because: first, it maximises expected social payoff; secondly, the seller has a distorted incentive to breach under actual damages due to the non-breaching party's option to not file a lawsuit.

The final type of related literature deals with the accuracy of the appraisal of damages and its incentive effects on the parties' primary behaviour. (See, Spier (1994), Kaplow and Shavell (1996)). These studies analyse the incentive effect of the accuracy of a court's assessment of damages on victim's reliance, information acquisition, and evidence production. However, their analysis focuses on a unilateral-care tort model, where, under the most reasonable conditions (and ignoring litigation costs), the victim would always sue for damages. Conversely, in our contract-based model, the victim might choose to not pay the contracted price in return for actual damages, when her post-breach valuation is low. As a result the breaching party's performance incentives are distorted. Friehe (2005) extends Kaplow and Shavell (1996) to a bilateral-care model and finds that the courts should utilise the information available to assess accurate damages. In addition, Friehe proposes using payments as an incentive to screen different types of victims and reduce the burden of assessment by inducing self-selection. However, even Friehe ignores the option to not sue and assumes that the filing of a lawsuit is exogenously given.
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4.1.2 Certain issues related to the applicability of damages:

From a social point of view, private information is a barrier to mutually beneficial exchange; it is a type of transaction cost that may prevent the parties from capturing a potential surplus or may lead them to enter into inefficient transactions. In the real-world the parties' individual/private interest in keeping information private makes the goal of full information revelation within a particular market unattainable. Rather than revealing such information, the parties will often driven by a “secrecy interest” prefer to forgo a lawsuit in the event of breach, change their patterns of contracting and/or important aspects of the terms on which they deal, or forgo the transaction entirely. As opposed to the secrecy interest there is a “compensatory interest” by the parties, which will compensate their expectation loss in the event of breach.

Thus the secrecy interest and the compensatory interest are often in direct conflict, they cannot be reconciled simply by elevating one over the other ex post. When the secrecy interest is sufficiently strong, the cost of revealing the underlying private information may well exceed the aggrieved party’s expected recovery from a trial. As a consequence, the aggrieved party may not file the suit and may therefore receive no compensation. As the breacher may be informed about the existence of the victim’s secrecy interest, she may breach too often. On other hand, if the victim of breach brings a suit and ask for expectation damage guided by compensatory interest, he will overstate his valuation, which is a pure rent-seeking motive.50

50 See Ben-Shahar and Bernstein (2006) for more on these issues and also on "expected expectation damage" (note that in their terminology it is "average expectation damage").
Thus from a policy perspective, the challenge therefore becomes to structure the legal rules in general, and damage remedies in particular, to achieve the "Second Best" outcomes in transactional contexts that to a greater or lesser degree will always be characterised by asymmetric information. In particular, damage measures like fully compensatory expectation damages that give efficient breach or perform incentives in an ideal world, need to be replaced or supplemented by measures that take into account the "secrecy interest" of the aggrieved party and the type of discovery that will be available.

4.2 The Model Setting:

We examine a contractual relationship between a buyer and a seller, where both the parties can undertake reliance investments and some unforeseen contingencies may induce the breach after an agreement has been reached. The buyer and the seller recognise this possibility and bargain both over price and over a damage stipulation, which the seller agrees to pay the buyer in the event of non-performance.

To formalise the model, let two risk-neutral parties, a seller and a buyer, meet at Time-1 to consider a project. A specific commodity is to be supplied by the seller under this contract, which would be further used as an intermediate input by the buyer to manu-

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51 The ex-post revelation of information that is required by subjective damage measures and the rules of discovery may also reduce parties' incentives to either deliberately acquire certain types of information or to invest in the types of innovations and activities whose profitability is dependant on keeping information private. Consider a manufacturer, who invents a low cost production process for a product. If she brings a suit for damages against a supplier of a component, she will have to reveal her cost of production, which will induce her competitors to try to obtain information about her production process. Protecting this type of information from revelation in such a suit would have the beneficial effect of preserving or enhancing parties' incentive to devise such innovations in the first place. More generally, there are many contracting contexts in which protecting private information ex-post is likely to create more efficient ex-ante incentives to gather and use information.
facture a final good whose uncertain demand is yet to be seen in the market. The project will certainly fail unless both the parties invest in it, though it may still fail even if both invest. If the parties do not reach agreement and thereby do not trade, then the investments undertaken by them are wasted — that is, their investments are fully relation specific and selfish. We consider a procurement contract between a seller and a buyer in a situation when after contracting neither party can find any other buyer or seller in the market for the specific commodity. Thus it is a thin market, and investments are agent specific too.

Now let us describe the ex ante uncertainty features of the model. The first source derives from the seller’s cost of production (as specified in the models of the previous two chapters). And the second one comes from the buyer’s valuation of the contract due to future fluctuations in the market prices of the products the buyer ultimately manufactures and sells. We assume here that the court cannot observe both the buyer’s true valuation and the exact cost of performance by the seller; however, the court is able to fashion a noisy estimate of both valuation and cost out of the information provided by the buyer and the seller during the trial (upon breach). What is clear, however, is that by the time the parties’ dispute is deliberated in the courts, both the parties will have learned the new market prices. The seller will know her costs and the buyer his valuation respectively at the individual level, but neither party is able to verify these valuations at court and therefore private information of the individual parties. So in the present model there is two-dimensional ex post asymmetric information between the parties themselves and the court. When dispute arises this creates a problem for the courts in terms of choosing a damage measure as the judges cannot credibly ascertain the expectation interest of the promisee.
The court can observe the written contract (which clearly specifies the good(s) to be delivered and the price to be paid) and can verify whether the good has been delivered and the price has been paid. Clearly, the courts can determine an efficient remedy if they have sufficient information about the valuations of the parties. However, being unable to verify the buyer's value and the seller's cost in actual terms, the court is limited in its ability to remedy the dispute efficiently and thus they often employ damages incorrectly that leads to an inefficient outcome.

4.2.1 Technical Assumption:

It is assumed that the buyer's valuation of the good and the seller's cost of performance are dependent on respective transaction-specific reliance investments incurred by them at the individual level, as well as the respective private information they may hold ex post.

Thus the buyer's valuation is denoted by:
\[ v = V(r^b) + \phi, \text{ so that } E(v) = V(r^b), V'(r^b) > 0, V''(r^b) < 0, \forall r^b, \]
with \( E(\phi) = 0, \text{Var}(\phi) = \sigma_\phi^2 \) and \( r^b \in [0, r^{b\text{max}}] \).

And the seller's cost of performance is denoted by:
\[ c = C(r^s) + \theta, \text{ so that } E(c) = C(r^s), C'(r^s) < 0, C''(r^s) > 0, \forall r^s, \]
with \( E(\theta) = 0, \text{Var}(\theta) = \sigma_\theta^2 \) and \( r^s \in [0, r^{s\text{max}}] \).

Here \( \theta \) and \( \phi \) represent the information parameters respectively for the seller and the buyer. These information parameters are random variable and can be thought of as agents' type; once realised by one particular agent, it is not observed by the other agent.
and thus is not contractible. So a contract cannot directly depend upon it. Let $f(.)$ and $F(.)$ respectively be the probability density function and the corresponding distribution function of the seller’s uncertainty component $\theta$; whereas $g(.)$ and $G(.)$ represent the same for the buyer. We assume that $f(.)$ and $g(.)$ are continuous and positive on their respective domains and they are independent [i.e. the seller’s private information does not affect the buyer’s valuation for the object, and vice versa]. The distributions $f(.)$ and $g(.)$ are common knowledge between the parties. Furthermore, we customarily assume that both $f(.)$ and $g(.)$ follow monotone hazard property.

4.2.2 Model Analysis:

In the face of two-sided ex post private information, an ex ante trading opportunity between the parties arises whenever $E(v) \geq E(c)$ i.e. whenever the buyer’s expected valuation is larger than the seller’s expected cost in Time 1, they may find the contracting worthwhile. Without any loss of generality, we assume here that the buyer holds the entire bargaining power and thereby he set a very low price $P$ in such a way (so close to $E(c)$) that only the seller faces the option to breach unilaterally. (In a polar case, the buyer leaves the seller with a zero surplus from the contract.) Note here, in this particular kind of set up, either party can contemplate breaching the contract whenever the cost of performance is higher than the value. But we restrict our analysis to unilateral breach by the seller; the analysis of breach by the buyer follows similar line.

Lemma 4.1: (The First Best)
The optimum level of reliance investments under two-way asymmetry must be lower not only compared to the social optimum under complete information but also less than the optimum levels of reliance under single dimensional asymmetry.

**Proof:** The first best is achieved if the ex ante investment decision and the ex post trade decision are efficiently made. Therefore, following the convention of the previous models, before the realisation of \( c \) and \( v \), the probability of efficient performance is:

\[
\Pr(\text{efficient performance}) = \Pr[c \leq v] = \Pr[C(r^s) + \theta \leq V(r^b) + \phi]
\]

\[
= \Pr[\theta - \phi \leq V(r^b) - C(r^s)] = \Pr[\xi \leq V(r^b) - C(r^s)]
\]

\[
= H[V(r^b) - C(r^s)], \quad (4.1)
\]

where \( \xi = (\theta - \phi) \sim h(0, \sigma^2 + \sigma^2) \), \( \therefore \theta \) and \( \phi \) are independent.

And

\[
\Pr(\text{efficient breach}) = 1 - H[V(r^b) - C(r^s)] \quad (4.2)
\]

This completes the analysis of the efficient breach decision. Given the efficient breach decision, the other issue is to determine the efficient amount of reliance. Given the efficient probability of breach, the socially efficient reliance investment by the buyer is that which maximises the joint expected value of the contract. The expected joint value is defined as:

\[
EPJ = [1 - H[V(r^b) - C(r^s)]](0 - r^b - r^s)
\]

\[
+ H[V(r^b) - C(r^s)]\{[E(v) - r^b - P] + [P - r^s - E(c|c \leq v)]
\]

\[
= H[V(r^b) - C(r^s)][V(r^b) - \{E(C(r^s) + \theta|C(r^s) + \theta \leq V(r^b) + \phi)\}] - r^b - r^s \quad (4.3)
\]

For the Kaldor-Hicks efficient level of investments that maximise this joint value, we deduce the first order condition as:
4.2 The Model Setting:

For the buyer,

\[ EPJ'(r^b) = h(.).V'(r^b).V(r^b) - h(.).V'(r^b).V(r^b) + H(.).V'(r^b) - 1 = 0 \]

\[ \Rightarrow \quad H[V(r^b) - C(r^s)].V'(r^b) = 1 \]

At the efficient level of investment for the buyer, we have:

\[ V'(r^{b**}) = \frac{1}{H[V(r^{b**}) - C(r^{s**})]} > 1, \quad [\text{since } H(.) < 1] \quad (4.4) \]

Since \( V'(r^{b**}) > 1 = V'(r_c) \), this means that, since \( V'(r^b) > 0 \) and \( V''(r^b) < 0 \), the amount of investment under two-sided uncertainty must be less than the amount without any uncertainty.

Now for the seller,

\[ EPJ'(r^s) = h(.).[-C'(r^s)].V(r^b) - h(.).[-C'(r^s)].V(r^b) + H(.).C'(r^s) - 1 = 0 \]

\[ \Rightarrow \quad H[V(r^b) - C(r^s)].C'(r^s) = -1. \]

Thus, at the efficient level of investment for the seller, we have:

\[ -C'(r^{s**}) = \frac{1}{H[V(r^{b**}) - C(r^{s**})]} > 1, \quad [\text{since } H(.) < 1] \quad (4.5) \]

This means that the amount of investment under dual sided uncertainty must be less than the amount without any uncertainty since \( C'(r^s) < 0, C''(r^s) > 0 \).

So at this point we are in a position to weigh the levels of reliance in the present model with that of the previous model (chapter 3) involving one dimensional asymmetry. Comparing the expressions of equations (3.4) & (3.5) respectively with the equations (4.4) & (4.5), we can infer that under two-way uncertainty level of investments would be even less vis-à-vis under one-sided uncertainty [since \( H(x) < F(x) \) for all \( x > 0 \) except at the
4.3 Court imposed Damages:

4.3.1 The setting

To formalise the model, assume as before, the buyer offers the seller at Time 1 a take-it-or-leave-it contract \((P)\) for exchanging one unit of an indivisible specific good. The price will be paid when the seller performs. Once the contract is signed; it becomes binding and no further alteration is allowed.

At Time 2, both the parties invest in their respective cost and valuation. At the end of this phase, all uncertainties relating to cost and valuation starts getting resolved in the sense that all new information, unknown at the time of contracting, is now revealed. At
Time 3, once the seller realises her exact cost of performance, she decides whether to perform the contract or to repudiate. It is useful to consider a situation where the seller contemplating breach does not know the actual loss it will cause the buyer—a paradigmatic case of asymmetric information. Thus in deciding whether or not to breach, the promisor will attempt to estimate the expected value of the damages she will be ordered to pay if a suit is brought (a suit may not be even brought). So she decides on the basis of two factors—first, the pre-decided price \( P \) and secondly, the forthcoming default legal damages regime a court will adopt and apply at Time 5 if the seller does not deliver at Time 3 and a lawsuit is filed by the buyer at Time 4 \(^{52}\).

In case the seller chooses to repudiate (i.e. she delays her delivery), then the buyer reasonably suspects that the seller will not perform at Time 4, as was promised. The buyer's suspicions could be based on a message that he received from the seller (such as a letter saying he would not perform in time) or due to some exogenous information that has arrived (for example, the seller has filed for bankruptcy \(^{53}\)). The buyer files a suit. At Time 4, trial starts, since the goods have no readily available market price the court hears evidence about the damages that the breach of the promise to deliver has caused to the buyer and consequently determines the amount of damages the seller needs to pay the buyer. We further assume that at Time 5 when the court makes its decisions, both the seller's cost

\(^{52}\) Also they may take into account the price and incentives to breach reflect the anticipated ex post costs of verifying a buyer's valuation, as well as whether the English rule of loser pays or the American rule of shared costs applies.

\(^{53}\) Assuming a firm to be risk-neutral but wealth-constrained is also consistent with the modern contract-theoretic formulation of the Shapiro and Stiglitz (1984) efficiency wage model, see e.g. Tirole (1999) or Laffont and Martimort (2002).
of performance and the buyer’s valuation are not observable to the other party and not verifiable to the court.\(^{54}\)

This creates a moral hazard problem and also gives vent for opportunistic behaviour by the parties. We demonstrate the impact of restitution and reliance damages first. Then we move to the case of expectation damage. When it comes to the court to fix the buyer’s expectation damages, the competence and the rationality of the court becomes quite important. At Time 4 when the buyer presents evidence to the court about his valuation, contract incompleteness coupled with asymmetry of information [within the parties and between the parties and the court] may create some room for the buyer to customise the evidence. We shall consider three distinct cases as to the court’s behaviour in this scenario.

### 4.3.2 Restitution Damages

Restitution damages are defined as the amount of money which restores the buyer to the position he was in before the breach was made. This means that if the buyer prepays the price \( P \) before delivery of the good, restitution damages will be \( D_s = P \). On the other hand, if, as we are assuming here, there is no prepayment of the price, \( D_s = 0 \). In this case, restitution damages are the same as no damages. The seller performs if: \( P - c \geq 0 \), or if, \( c \leq P \); otherwise she chooses to breach.

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\(^{54}\) This is a substantial departure from notions immanent in the existing models in the literature that deals with incomplete contracts. At Time 1, the parties only observe each other’s distributions and their estimates, and do not even know their individual (ex post) valuations. Thus in this sense are symmetrically uninformed ex ante. This is the only similarity with other models in the literature. Hidden action exists in the form of self investments by each party. At Time 3 asymmetry of information is introduced. Parties learn their individual valuations but still cannot observe (and definitely cannot verify) other’s valuation and finally the court knows nothing but the estimates.
Since $P \in \{[Y,\bar{Y}] \cap [\bar{c},\bar{c}]\}$ also $\bar{c} \leq Y \leq \bar{c} \leq \bar{Y}$, we cannot say conclusively that the seller breaches too often when compared to first best level of efficient breach, as was the case in earlier chapters. In fact, since the buyer's valuation is private information (moreover the seller cannot observe it) in some contingencies such as $\nu \leq P$, the seller cannot breach the contract. Thus the breach-set is actually smaller.

Therefore, $\Pr[\text{performance}] = \Pr[\theta \leq P] = \Pr[C(r^s) + \theta \leq P] = \Pr[\theta \leq P - C(r^s)] = F[P - C(r^s)]$

Now the buyer's expected payoff would be –

$$EPB = F[P - C(r^s)] \cdot [V(r^b) \cdot r^b - P] + \{1 - F[P - C(r^s)]\} \cdot \{0 - r^b\}.$$  

The first order condition for the buyer's payoff maximisation can be derived as –

$$EPB'(r^b) = F[P - C(r^s)] \cdot V'(r^b) - 1 = 0$$

$$\Rightarrow \quad V'(r^b_{\text{opt}}) = \frac{1}{F[P - C(r^s_{\text{opt}})]} \leq \frac{1}{H[V(r^{\text{best}}) - C(r^{\text{best}})]}$$

$\Rightarrow$ The buyer makes over-investment if $F[P - C(r^s_{\text{opt}})] > H[V(r^{\text{best}}) - C(r^{\text{best}})]$, and if $F[P - C(r^s_{\text{opt}})] < H[V(r^{\text{best}}) - C(r^{\text{best}})]$ then he would under-invest.

$\Rightarrow$ Investment incentive to the buyer cannot be said conclusively. Mostly likely, he (weakly) over-invests. Investment incentive is highly sensitive to the initial choice of contracted price $P$; it is also highly dependent on the seller's investment structure and particular shape of the two distribution functions $F(.)$ and $H(.)$. If $P$ is chosen sufficiently low then efficient investment or even under-investment is possible. [See the graph in the appendix.]
Similarly, the seller’s expected payoff would be –

\[ EPS = F[P - C(r^s)].\{P - r^s - E(c|c \leq P)\} + \{1 - F[P - C(r^s)]\}.(0 - r^s) \]

The first order condition for the seller’s payoff maximisation can be derived as –

\[ EPS'(r^s) = F[P - C(r^s)].[-C'(r^s)] - 1 = 0 \]

\[ \Rightarrow -C'(r^s) = \frac{1}{F[P - C(r^s)]} \leq \frac{1}{H[V(r^{bs*}) - C(r^{s*})]} \]

\[ \Rightarrow \] Most likely, the seller would also (weakly) over-invest in reliance. See the argument provided in the buyer’s case.

Remarks:

These (weak) over-investment results are in stark contrast to that under-investment results obtained under single dimensional asymmetry.

Intuition – Since the buyer’s valuation is private information, he receives some free performance (though inefficient from economic point of view as \( v \leq c \)) by the seller, in some contingencies as mentioned above. He then still gets some private return on the specific investment, even when the separation of the parties is efficient and the investment has no social return. This is the insurance motive. Since the buyer does not need to fully internalise all social cost of breach, his incentive to invest is not held-up here (when compared to our earlier models with one-sided private information of the seller). Besides, (if the contracted price is not so high) the seller anticipating this phenomenon increases her investment level to the point she has to perform under restitution damage. The precautionary motive operates for the seller.
4.3 Court imposed Damages:

4.3.3 Reliance Damages:

Reliance damages are defined as the amount of money that puts the buyer in the same position as he would be if the contract was not signed. The buyer’s position if the contract was never signed is zero, while his position in the event of breach is \{-r^b\}. Reliance damages are computed as the difference between these two, i.e. \( D_r = r^b \).

Now the seller’s payoff when the contract is honoured is: \{P - c\} ; and when she breaches her wealth: \{-D_r\}. Thus the seller chooses to perform when: \( P - c \geq -D_r \), i.e. \( P + r^b \geq c \), otherwise breaches.

Therefore, \( Pr[\text{performance}] = Pr[c < P + r^b] = Pr[C(r^s) + \theta \leq P + r^b] \)
\[ = Pr[\theta \leq P + r^b - C(r^s)] = F[P + r^b - C(r^s)] \]

Now the buyer’s expected payoff would be –

\[ EPB = F(.)[V(r^b) - r^b - P] + \{1 - F(.)\}.\{r^b - r^b\} \]

The first order condition for buyer’s payoff maximisation can be derived as –

\[ EPB'(r^b) = f(.)[V(r^b) - P - r^b] + F(.)V'(r^b) - 1 = 0 \]

Thus at the efficient level of reliance by the buyer, we get the following –

\[ V'(r^b_R) = 1 - \frac{f[P + r^b_R - C(r^s_R)]}{F[P + r^b_R - C(r^s_R)]} \]

\[ \leq \frac{1}{F[V(r^{b**}) - C(r^{s**})]} \]

\[ \Rightarrow \] Thus the buyer will over-invest compared to the first best.

Similarly, the seller’s expected payoff would be –

\[ EPS = F(.)[P - r^s - E(\{1 \leq P + \beta r^b\})] + \{1 - F(.)\}.[-\beta r^b - r^s] \]
The first order condition for seller's payoff maximisation can be derived as –

\[ EPS'(r^s) = F(.)[-C'(r^s)] - 1 = 0 \]

\[
\text{i.e. } - C'(r^b) = \frac{1}{F[P + r^b - C(r^s_R)]} < \frac{1}{F[V(r^{b**}) - C(r^{s**})]} \tag{4.7}
\]

\( \Rightarrow \) The seller will also be investing more relative to the first best.

Remarks:

The buyer is as usual investing excessively under reliance damage because of the separation prevention motive. But over-investment by the seller here stands in surprising contrast to the case single dimensional asymmetry. This again happens because of the precautionary motive adopted by the seller, similar to the case of restitution damage.

Notice here that the seller's equilibrium investment incentive condition (4.7) in this case is essentially the same as the condition (3.10) in one-sided asymmetry case of the previous chapter. So naturally the question arises here, how do we get this over-investment result? The reason is that the first best levels are different for different dimensions of asymmetry. The first best optimum level of reliance under two-sided private information is lower than that under one-sided private information. [See Lemma 4.1]. Thus when the reliance damage is the concerned remedy, even if the seller undertakes same amount of investment in both the cases, her investment stands higher under two-sided asymmetry whereas falls below under one-sided asymmetry (compared to the respective first best levels).
4.3.4 Analysis of Expectation Damage:

Whenever it is efficient for the seller, she pays the court-imposed expectation damages at Time 3 and exit the contract. So, the seller’s gain on performance is \((P - c)\) and on failure to honour the contract is \((-D_E)\), where \(D_E\) is the expectation damage measure. Therefore, the seller will perform whenever: \(P - c > -D_E\), otherwise will breach.

In the face of breach, the buyer will most likely misguide the court about his actual valuation of performance of the contract so that his ex post payoff increases. At this juncture, it is worth commenting on how his expected payoff may vary depending upon how the court reacts to his claim on valuation. There could be different level of strictness (competence) attached to the different courts. There are three possible cases – (a) the court is naive and simply believes in the evidence produced by the promisee regarding his (inflated) valuation and grants expectation on the basis of that; (b) the court is very strict and refutes the evidence and only accepts the ex ante expected level of the promisee’s valuation; and (c) the court at its discretion chooses a value in between the expected valuation and the evidential (inflated) valuation by the promisee.

We have sought to focus on these cases because of the interest in contributing to the legal debates on expectation liability for reliance. When expectation interest is not properly verifiable in the court either because of the uncertainty in valuations or because of hidden information, the liability for such reliance is highly debated in the literature. Legal debate is thus relevant to those cases in which liability could in principle be imposed by the courts.

---

55 When breach is occurring, the value of performance to promisee a part of which is a function of non-verifiable reliance will not have materialised, so there’s nothing for the court except the initial estimate from which the court can infer exact value. Court either has to believe reported value or go by the estimate or arbitrarily decides the level from the available set of information.
and the question is whether it should be imposed and to what extent. Let us now one by one try to show what happens in the aforementioned three different situations.

**Case-1: The court is naive**

In this case, the court adopts "subjective measures" of damage that either require the revelation or permit the discovery of firm-specific information. The court accepts the evidence put before it by the promisee (buyer) and grants him to recover $D_E$, the expectation damage measure based on the buyer's reported valuation, denoted by $\hat{V}$, to the court. Thus $D_E = \hat{V} - P$. Therefore, the seller will breach whenever $c > \hat{V}$, and will perform otherwise. Thus we calculate the probabilities of performance and breach –

$$
\Pr(\text{performance}) = \Pr[c \leq \hat{V}] = \Pr[C(r^s) + \theta \leq \hat{V}]
$$

Thus

$$
\Pr(\text{breach}) = \Pr[\theta \leq \hat{V} - C(r^s)] = F[\hat{V} - C(r^s)]
$$

Therefore, buyer's expected payoff would be –

$$
EPB_E = F[\hat{V} - C(r^s)].[E(v) - P - r^b] + [1 - F(\hat{V} - C(r^s))].[D_E - r^b]
$$

$$
= F[\hat{V} - C(r^s)].[C(r^b) - P - r^b] + [1 - F(\hat{V} - C(r^s))].[\hat{V} - P - r^b]
$$

$$
= \hat{V} - F[\hat{V} - C(r^s)].[\hat{V} - P - r^b] + \hat{V} - F[C(r^s) + \theta | C(r^s) + \theta \leq \hat{V}] - \hat{V} + \{1 - F[.].\hat{V}
$$

Similarly, the seller's expected payoff is –

$$
EPS_E = F[\hat{V} - C(r^s)].[P - r^s - E[c | c \leq \hat{V}]] + [1 - F(\hat{V} - C(r^s))].[-D_E - r^s]
$$

$$
= P - r^s - F[.].E[C(r^s) + \theta | C(r^s) + \theta \leq \hat{V}] - \hat{V} + \{1 - F[.].\hat{V}
$$

Now to check the investment incentives for the parties, we derive following lemma –
Lemma 4.2:

To check whether the buyer and the seller make efficient investment or not, we now one by one maximise the buyer’s expected pay off in equation (4.8) with respect to $r^b$ and the seller’s expected pay off in equation (4.9) with respect to $r^s$ –

$$EPB^i_E(r^b) = F[\hat{V} - C(r^s)].V'(r^b) - 1 = 0$$

$$\Rightarrow F[\hat{V} - C(r^s)].V'(r^b) = 1$$

Therefore,

$$V'(r^b) = \frac{1}{F[\hat{V} - C(r^s)]} \leq \frac{1}{F[V(r^{b**}) - C(r^{s**})]} = V'(r^{b**}) \quad (4.10)$$

Thus from the previous expression we cannot conclusively comment upon whether the buyer would make over-investment or efficient investment in reliance compared to the first best level in this case; we need further evidence on to be able to compare the values of $F(.)$ and $H(.)$ in the expression (4.10).

The seller’s expected payoff maximisation gives us the following –

$$EPS'_E(r^s) = -1 - [\hat{V} - C(r^s)].[\hat{V} - C(r^s)].V - F[\hat{V} - C(r^s)].C'(r^s) + f[\hat{V} - C(r^s)].[\hat{V} - C(r^s)] = 0$$

$$\Rightarrow F[\hat{V} - C(r^s)].C'(r^s) = -1$$

Therefore,

$$-C'(r^s_E) = \frac{1}{F[\hat{V} - C(r^s)]} \leq \frac{1}{F[V(r^{b**}) - C(r^{s**})]} = -C'(r^{s**}) \quad (4.11)$$

Again we cannot say conclusively about over/under/efficient level of investment by the seller compared to first best. Comment no.7, following the lemma below, will conclusively state the equilibrium outcome.
Now, when the buyer tries to maximise his expected payoff by choosing $\hat{V}$, we get the following condition –

$$f[\hat{V} - C(r^b)].1.V(r^b) + 1 - f[\hat{V} - C(r^b)].\hat{V} - F[\hat{V} - C(r^b)].1 = 0$$  \hspace{1cm} (4.12)

We derive the following lemma –

**Lemma 4.3:**

$$\hat{V}^E = E(v) + \frac{1 - F[\hat{V} - C(r^E)]}{f[\hat{V} - C(r^E)]}, \quad \text{where } E(v) = V(r^b)$$  \hspace{1cm} (4.13)

$$P^E = E(c|c \leq \hat{V}^E) + \{1 - F[\hat{V}^E - C(r^E)]\}.\hat{V}^E,$$

$$D^E = F[\hat{V}^E - C(r^E)].\hat{V}^E - E(c|c \leq \hat{V}^E).$$

**Proof:** $\hat{V}^E$ is directly derived from equation (4.12). This $\hat{V}^E$, as we shall call, is agent’s “virtual valuation under expectation damage” $^56$. The other conditions are calculated by substituting the F.O.C. values in the relevant places. \hfill $\Box$

**Observations:**

1. Observe that the F.O.C. implies that $\hat{V}^E \geq E(v)$.

2. From the equation (4.13), we can see that the buyer tend to inflate his valuation by the amount $\left\{ \frac{1 - F[\hat{V} - C(r^E)]}{f[\hat{V} - C(r^E)]} \right\}$. This evidence confirms our suspicion that the buyer would try to fetch more than his expected valuation during the litigation by misguiding the court.

3. As buyer’s $E(v)$ increases, the buyer’s reported value $\hat{V}^E$ also increases, but the exaggeration factor (i.e. $\frac{1 - F[\hat{V} - C(r^E)]}{f[\hat{V} - C(r^E)]}$) decreases. This can be directly derived from the monotone hazard property we ascribed on $f(.)$.

---

$^56$ The ‘virtual valuation’ cost’ (see, Myerson, 1981) appears in many related models where agents have private information about their willingness-to-pay. See Bulow and Roberts (1989) for an interesting economic interpretation of ‘virtual valuations’ and ‘virtual costs’.
4. Observe that the buyer faces an ambivalence in terms of (mis)reporting his anticipated value to the court: if the buyer inflates his valuation and the seller's cost is even higher (with the probability, \( [1 - F(\hat{V} - C(r^s))] \)), then the seller will breach and the buyer wins higher damages. However, a higher reported valuation, and hence a higher damage payment, will discourage the seller from breaching, in which case the buyer only gets \( E(v) \) instead of a higher \( \hat{V}^E \). He will balance these two countervailing incentives when choosing his evidence.

5. Note that in this case we assumed that the buyer’s uncertainty has not realised fully when the breach occurs and so he has reported an anticipated valuation. However, even if his valuation is fully realised, it is his dominant strategy under trial to report such a valuation so long as his actual valuation \( v < \hat{V}^E \). Also to be noted here that in case the buyer’s actual valuation \( v > \hat{V}^E \), then he may even insist for a "specific performance remedy" in the court.

6. Note here that the seller breaches whenever \( c > \hat{V}^E (\neq v) \). Therefore, importantly, there is inefficient breach from both ex ante as well as ex post perspectives. Clearly, there is under-breach if \( v < \hat{V}^E \) and there is over-breach whenever \( v > \hat{V}^E \).

7. Therefore in the light of the previous point, we can now conclusively say that in the expressions (4.10) and (4.11) only strict inequality hold good [since \( F(.) > H(.) \), refer to the figure in the appendix], and thus both the buyer and the seller will (weakly) over-invest in reliance compared to the individual first best levels under this case.

**Intuition:** When a naive court accepts the buyer’s reported value in establishing the expectation compensation, knowing this the buyer then does not stretch his reliance too
much rather tries to customise his report which maximise his gain. We mean to say that while the insurance motive is still present in the mind of the buyer, the separation prevention motive is absent here (as against the Case-II, see the intuition of the remark no.3 following the lemma 4.4 below).

**Remarks:**

Note that, in a special case when $F[V - C(r^*)] = H[V(r^b) - C(r^*)]$, then both the buyer and the seller would undertake efficient levels of investment as under first best. This is striking and has important bearing on court-decisions to uphold efficiency (at least in terms efficient reliance when ex post efficient breach is very unlikely). In case the parties foresee this particular possibility, they may at the time of contracting (under the provision of liquidated damage) fix a high-penalty [according to $F(.) = H(.)$] as a default option in case of dispute, which will effectively ensure the efficient reliance for both the parties. Also note that this penalty may often be higher than the *actual expectation damage* (in case verified, it could be lower as well; but certainly higher than the *Expected expectation damage* [vide equation (4.13)] at the time of dispute settlement depending upon the realisation of the buyer’s valuation. Note that this finding stands in stark contrast to the result by Stole (1991), where he mentioned that liquidated damages could not be higher than the buyer’s expected valuation. In fact, his analysis was motivated by the social welfare maximisation whereas our result arises from the parties’ interest to induce the efficient reliance when the efficient breach is difficult to detect. But it is noted in the literature that the courts routinely refute these stipulated penalties in case of disputes and only allows non-penalty liquidated damages. What is surprising here: When the promisee’s expectation interest is difficult to
monetise and the contract is silent regarding remedies, the court at its will may threaten the promisor with a large penalty (actually this is the specific performance remedy) in order to induce the promisor either to perform or to make a supra-compensatory payment to the promisee. However, when the promisee’s expectation is difficult to monetise, the parties themselves cannot threaten the promisor with a large penalty in order to induce the promisor either to perform or to make a supra-compensatory payment to the promisee. Why can the courts do what the parties cannot? Without questioning the welfare impacts of the penalties, from the logical point of view we advocate that the court (which itself suffers from lack of competence in the face of parties’ private information) should drop their bias towards this issue and allow the parties to set the contractual terms freely (under mutual assent).

**Case-2: The court is strict**

When the court is strict, it adopts measures that neither require the aggrieved party to reveal, nor permit the breaching party to discover, firm-specific information. It completely overlooks all the evidences produced by the promisee regarding his ex post valuation and only accepts $E(v)$, which is observable and easier to calculate and may be due to the seller’s refutation. This is thus an “objective damage” measure. We call this as “Expected

57 Generally speaking, objective remedies tend to do a relatively good job of protecting the aggrieved party’s “secrecy interest,” but will often fail to protect her compensatory interest because they do not transaction-specific elements of value into account. In contrast, subjective remedies seriously jeopardize the aggrieved party’s “secrecy interest”, and may also jeopardize her compensatory interest, once the interplay between the “secrecy interest” and the compensatory interest is taken into account. Although subjective remedies like the expectation measure (case I) may appear to be well-suited to the goal of full compensation, since they are closely tailored to the actual losses of a particular aggrieved party, an aggrieved party who is concerned with keeping information private may be reluctant even to file a suit seeking a subjective damage measure. Such a party may rationally prefer to forgo her compensatory interest because pursuing a subjective remedy would give the defendant the right to obtain her valuable private information through discovery. Moreover, in
Expectation Damage. Thereby, the court sets expectation damage $D_e = E(v) - P$ and allows the breach victim to recover this amount when trade is inefficient. Thus, the seller performs iff: $P - c \geq -D_e = -\{E(v) - P\}$ or if, $c \leq E(v)$; otherwise she breaches.

Therefore, $\Pr[\text{performance}] = \Pr[c \leq E(v)] = \Pr[C(r^s) + \theta \leq E(v)]$

\[
= \Pr[\theta \leq E(v) - C(r^s)] = F[V(r^b) - C(r^s)]
\]

Now the expected payoff for the buyer would be –

\[
EPB_e = F[V(r^b) - C(r^s)].\{E(v) - P - r^b\} + \{1 - F[V(r^b) - C(r^s)]\}.\{D_e - r^b\}
= V(r^b) - P - r^b. \tag{4.15}
\]

And the expected payoff for the seller would be –

\[
EPS_s = F[V(r^b) - C(r^s)].\{P - r^s - E(c|c \leq E(v))\} + \{1 - F[V(r^b) - C(r^s)]\}.\{-D_e - r^b\}
= P - r^s - F[V(r^b) - C(r^s)].E(C(r^s) + \theta|C(r^s) + \theta \leq V(r^b))
- V(r^b) + F[V(r^b) - C(r^s)].V(r^b). \tag{4.16}
\]

**Lemma 4.4:**

To check whether the buyer and the seller make efficient investment or not, we maximise the buyer’s expected payoff in equation (4.15) with respect to $r^b$ and the seller’s expected payoff in equation (4.16) with respect to $r^s$ –

\[
EPB_e'(r^b) = 0 \Rightarrow V'(r^b_e) = 1 < \frac{1}{F[V(r^{b**}) - C(r^{s**})]} = V'(r^{b**}) \tag{4.17}
\]

situations where the existence of the potential aggrieved party’s “secrecy interest” is known to a promisor contemplating breach, the would-be aggrieved party’s threat to sue in the event of breach may lose its credibility, thereby increasing the likelihood of breach and further jeopardizing her compensatory interest.
4.3 Court imposed Damages:

⇒ The buyer will (severely) over-invest in reliance compared to the first best level.

Again,  

\[EPS'_b(r^b) = -1 - f[V(r^b) - C(r^b)]\left[-C'(r^b)\right] \cdot V(r^b)\]

\[-F[V(r^b) - C(r^b)] \cdot C'(r^b) + f[V(r^b) - C(r^b)] \cdot [-C'(r^b)] \cdot V(r^b) = 0\]

⇒ \[ - C'(r^*_e) = \frac{1}{F[V(r^b_e) - C(r^*_e)]} < \frac{1}{F[V(r^{b**} - C(r^{***})] \] \] \]

⇒ The seller will also over-invest in reliance compared to the first best level. □

Remarks:

1. Note here, level of reliance investments both by the buyer and the seller in this case is equivalent to that in model of the previous chapter where there is only one-sided uncertainty pertinent to the seller’s cost of performance. This result is not very surprising as the breach decision is unilateral in both the cases and is exercised by the seller.

2. Note that the breach condition here is not exactly the same for efficient breach; we observe that the seller breaches whenever \( c > E(v) \). This is inefficient in some states of the world when \( E(v) > v \). Therefore, importantly, there is over-breach form the ex ante perspective. Also worth noting, from the ex post perspective, there is under-breach whenever \( E(v) > v \) and there is over-breach if \( E(v) < v \).

3. Comparing the expressions (4.17) with (4.10), we can conclude that the investment incentives to the buyer under case-II is far higher than under case-I. The reason being twofold: first, an insurance motive (which is common argument for expectation damages), secondly, here separation prevention motive also works (in contrast to the view of Sloof et al. 2006; they say that this motive only works under reliance damage measure) as the buyer’s expected valuation directly dependent on his investment choice (by construc-
tion, in our model). In this case the buyer is better off when the parties trade than when they efficiently separate, he may therefore have an incentive to invest at least so much such that the valuation within the relationship reaches the highest possible valuation.

4. Now for the seller, comparing the expressions (4.18) with (4.11), we can infer that the investment incentives to the seller under case II is somewhat higher than under case-I. The reason being – when the buyer invests far in excess due to separation prevention motive and force the seller to perform, the seller to cope with this extra burden of performance to also be induced to undertake excess investment that will further reduce her cost of performance. This is just the precautionary/insurance motive.

In case the court imposes a measure of damages that is equal to the breacher’s estimate of the aggrieved party’s loss (and does not condition on the aggrieved party’s subjective loss), then the seller’s breach-or-perform decisions under this “flat” measure of damages would be the same as they would be if the law provided for the recovery of fully compensatory expectation damages. As has been recognised in the tort literature, accuracy in the assessment of damages is socially beneficial only if it can improve incentives ex ante—that is, only if the party contemplating an action has access to the more accurate information at a reasonable cost at the time he is deciding how to act.

**Case-3: The court’s nature and behaviour are uncertain**

Different courts will have different levels of naivety. To capture this point, we assume that the courts will determine the expectation damages in such a way that it may lie somewhere in between thresholds of the aforementioned two cases. Thus, the court is as-
sumed to hear the buyer’s report and, knowing that the buyer has an incentive to mis-report the loss, the judge will also use his/her discretion to make some (downward) adjustments. Specifically, we assume that the damages will be a linear combination of the buyer’s report ($\hat{V}$) and the buyer’s (observed / expressed) expected value $E(v)$, i.e., the new measure of damage will be

$$d_n = \gamma D_e + (1 - \gamma) D_E$$

$$= \gamma [E(v) - P] + (1 - \gamma) [\hat{V} - P] = \hat{V} - P + \gamma [E(v) - \hat{V}],$$

where $0 \leq \gamma \leq 1$ is a parameter representing the court’s level of “strictness”. We assume that the buyer does not know in advance the level of strictness of the court, and therefore cannot adapt its report to the specific court in which the trial takes place. Instead, we assume that the buyer can observe only $E[\gamma]$, the average level of strictness of the court, when it decides whether and by how much to inflate her loss. At Time 4, based on the evidence that the buyer has presented to the court, the court decides the amount of expectation damages that the breach caused. Then, after the trial, but before Time 5, the buyer learns her realised valuation.

We suppress the calculations at this stage since it will proceed in the same way as in case-1 and the results would be pretty much similar. Only difference arises here that the buyer would be less aggressive in exaggerating his reported value.

**A case of Buyer’s ex post verifiable valuation to court:**

It was assumed that the seller’s costs and the buyer’s valuation are private information and non-observable to the other party throughout the entire transaction. Now for dis-
4.4 Social Welfare and the Damage Measures

Positional purpose we think that the buyer’s damages are verifiable ex post (only) in court through discovery not while the seller is making a decision on performance or breach. We assume that there are no costs associated with the verification of the buyer’s ex post valuation (or there could be some reasonable cost for verification; under Common Laws this cost is borne by the seller/promisor whereas under US laws this cost goes to the buyer/promisee). As buyer’s valuation is verifiable to court, then court is capable of awarding actual damages. But there is a catch; the buyer in this case would only file a lawsuit when his ex post actual valuation is larger than the contracted price; otherwise the buyer might end up paying damages. Thus, the seller does not, in fact, face the entire distribution of buyer’s valuations under actual damages remedy. Instead, he faces a truncated distribution which has a higher mean than the ex ante expectation damages he would pay under the fixed ex ante expectation damages remedy. As a result, the seller breaches too little. Therefore, joint welfare in an actual damages award regime is reduced relative to a fixed expected expectation damages regime. We suppress the calculations for the analysis of incentives to investment and breach, as it is again expected to be inefficient just like the previous cases we discussed shortly.

4.4 Social Welfare and the Damage Measures

Let us now try to find the optimal value of $D$, that is, the value of $D$ that maximises the total ex post surplus. In this regard, we assume a unilateral breach by the seller so that the seller will pay the amount $D$ and free himself of the contract iff: $P - c < -D$.

Therefore, $\Pr[\text{Performance}] = \Pr[P + D \geq c] = \Pr[\theta \leq P + D - C(r^a)]$
4.4 Social Welfare and the Damage Measures

\[
EPJ(D) = F[P + D - C(r^s)].\{E() - P - r^b\} + [P - r^s - E(c|c \leq P + D)]
\] 
\[
+ \{1 - F[P + D - C(r^s)]\}.\{[D - r^b] + [-D - r^s]\}
\] 
\[
= F[P + D - C(r^s)].\{E(v) - E[C(r^s) + \theta|C(r^s) + \theta \leq P + D]\} - r^b - r^s
\]

We want to maximise this with respect to \(D\) bounded in the region \([0; P - C_{min}]\). The upper bound comes from the fact that if \(D\) is too high it will never be paid by the breacher or else too high a \(D\) would be treated as specific performance.

Let us define: \(D^* = \arg \max EP(D)\). Solution to the previous equation gives us a situation that entails the optimal mechanism is the "expected expectation damage".

**Proposition 4.1:** \(D^* = \min[E(v) - P, P - C_{min}]\).

**Proof:** the First Order Condition gives us –

\[
EPJ'(D) = f'[P + D - C(r^s)].1.V(r^b) - f'[P + D - C(r^s)].1.(P + D)
\]
\[
= f'[P + D - C(r^s)].\{V(r^b) - P - D\}
\]

And the second order condition gives us –

\[
EPJ''(D) = f''[P + D - C(r^s)].1.(V(r^b) - P - D) - f'[P + D - C(r^s)].1
\]

Therefore, setting \(D^* = V(r^b) - P\) gives us the unique global maximum since

\[
EPJ'[V(r^b) - P] = 0
\]

and \(EPJ''[V(r^b) - P] = -f[V(r^b) - P] < 0\)
Note here that by setting $f[P - C(r^*) + D^*] = 0$ instead, we cannot get another solution since $f(.)$ is strictly positive. Also worth noting that $P + D - C(r^*) > 0$ by assumption (we assumed unilateral breach by the seller), thus –

$$D^* = E(v) - P \text{ or, } P - C_{min},$$
depending upon the parameters in the claim. □

Thus we summarise our observations from the three cases in the form of following claim –

**Claim 4.1:** Under a fixed price incomplete contract that has bilateral investments and two-dimensional asymmetry, any variant of Expectation damage remedy results neither in ex ante efficient relation-specific investment nor in ex post efficient breach; although Expected Expectation Damage (case II) optimises expected social welfare and High Expectation damage (case I) may induce efficient reliance.

### 4.5 Party designed Liquidated damages

*The setting and Analysis:* Since the parties are risk neutral and go by the estimates rather than the actual values, we hereby suppress the analysis and associated calculations and refer the reader to the analysis of liquidated measure in chapter 3 (the calculations are exactly the same).

**Observations and Remarks:**

1. Note that under liquidated damage $p + D_L = V(r^b) = E(v)$. This is just the same condition that induces efficient breach under expectation damage in one-sided uncertainty model.
2. Also note that under liquidated measure \( p + D_L = V(r^b) = E(v) \) means that this damage is equal to the expected expectation damage (case II) when court is strict.

3. Under liquidated damage measure, we observe that the reliance levels undertaken by the parties as follows: for the buyer, \( V'(r^b) = 1/F(p + D_L) \),

and for the seller, \( C'(r^s) = -1/F(p + D_L) \).

Thus level of investments undertaken by the said parties are still inefficient compared to the first best levels (the buyer over-invests and the seller under-invests), but the buyer invests less and the seller invests less (and that is exactly equal to the level in case II).

4. Note from the ex ante perspective there is efficient breach but ex post there could be inefficient breach whenever \( c > E(v) \). To put it starkly, the inefficiency arises in both the cases when \( v > c > E(v) \) and when \( v < c < E(v) \).

From our analysis it is quite evident that in the presence of ex post double sided asymmetry when the parties employ a fixed price contract neither the party-designed liquidated damage nor any variant of expectation damage measure awarded by the court can achieve the first best. However, among all the considered measures liquidated measure performs the better than court imposed ones in terms of reducing the moral hazard phenomena.

4.6 Conclusion:

The earlier literature on the analysis of contract remedies for breach does not account for the non-breaching party’s option to not sue for damages upon breach. Typically their work on the efficiency analysis of various contract remedies invariably assumes that there will be a litigation for the contract-breach. However, we have identified that the vic-
tim of breach might choose not to sue for remedy if the expected payoff from the lawsuit is negative, given the contractual terms and her private information about her loss from breach. Our analysis have shown that this option of assenting to a breach as well as the non-observability of the parties’ valuations and reliances together have important implications for the incentives to both breach and reliance and the efficiencies of various contract remedies. Specifically, we have also pointed out that when actual expectation damages of the victim (although not directly observable to the breacher, but) can be verified later (at a cost) in the court, it will induce under-breach from the ex ante perspective. Lastly, we have also investigated the court’s optimal choice of damages under the case of non-verifiable damages, where the parties engage in a strategic signaling game trying to present evidence strategically to influence the court’s damages award. And our results have two-fold implications: first, when the parties do not specify any particular damage measure in their initial contract, the courts should adopt the expected expectation damage as this will augment the social surplus and to some extent curb the strategic behaviour of the parties, although this does not lead to efficient investments by the parties; secondly, in case the parties come up with mutually agreed some liquidated damage provision in their contract the courts should implement the same unequivocally, as the parties might be designing this damage provision either from the perspective of maximising the joint payoff or from the perspective of implementing an efficient level of bilateral reliance investments (and since there’s no third party or any other externality is present).
Note: The red curve (the thick continuous line) \( H(.) \) is the normal distribution function with variance 100 and the blue curve (the broken line) \( F(.) \) is the normal distribution with variance 25, mean in both case being zero.