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INFORMATION ACQUISITION AND DAMAGES FOR BREACH OF CONTRACT: AN ECONOMIC ANALYSIS

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Abstract

An early, but crucial decision one often makes in a contractual setting is whether to undertake an obligation, although the ultimate cost of performing it is yet uncertain. Two options present themselves in such a context: one is to assume the commitment nevertheless, knowing that with some probability it would engender a loss; another is to acquire information, and then proceed to contract only if the commitment is indeed advantageous. This paper examines the socially optimal choice in that regard, and compares it to the privately optimal choice, derived as a function of the legal consequence of breach. It is initially shown that the party's private incentive to invest in information essentially always departs from the social optimum. If the acquired information is observed by his counterpart, then his incentive to acquire it will be too weak regardless of the applicable damage measure; and if he can withhold the information from his counterpart, his incentive to acquire it will generally be excessive under the expectation measure, but might also remain inadequate under measures of lesser magnitude.

It is further shown that parties will often fail to select the welfare-maximizing measure, even though they are rational by assumption, and act under complete freedom of contract. Moreover, in some cases, the very capacity to alleviate uncertainty will generate a welfare loss, relative to a setting in which there is no such capacity. The source of these failures is rooted in strategic behavior, which is endemic to the information-gathering process (and therefore does not appear in models where uncertainty is exogenous.) The paper identifies these failures and characterizes their overall impact. In a limited set of cases, it is shown that the parties may overcome them by entering into a "hands-tying" agreement, in which they commit to select a particular measure in a future contract. The proposed solution is argued to have theoretical appeal, albeit only limited practical viability.

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I. Introduction

When contractual relationships go astray, it is generally attributable to some form of uncertainty. In a certain world, contracts would rarely be incomplete, as there would be only a single contingency to account for; breach would never be efficient, as parties would enter into contracts only if their performance is mutually desirable; reliance would be pursued optimally, as it would always yield its anticipated return; and problems such as achieving a desired allocation of risk, optimal precautionary behavior or optimal damage mitigation would simply not emerge, as there would be no risk to allocate, no need for precautions, and no harm to mitigate. Hence, uncertainty lies at the core of contract law. It is the primal element explaining the pathologies of the field, and the factor defining the function and purpose of its legal regulation.

The policy-maker, seeking to address the problems associated with uncertainty, might contemplate two potential strategies to further that end. Using a medical analogy, uncertainty is the ultimate contractual disease, which policy-makers set out to cure. As in the world of medicine, one way to confront a disease is by developing means to *treat those already infected*, attempting to relieve them of the adverse consequences of their illness. Quite a different strategy is to seek out the means to reduce *the incidence of the disease,* thereby preventing potential patients from ever becoming infected. In the contractual realm, the former option amounts to taking uncertainty as given, and then aiming to construct a legal framework that would correct the harmful inefficiencies it produces. Conversely, the latter strategy would amount to using the law as an instrument to control the incidence of *uncertainty itself*, the root cause of all contractual evil. Rather than an attempt to craft a curative solution to the byproducts of uncertainty, this approach would seek to prevent them from ever arising.

To be sure, both these potential strategies would advance the same ultimate end: they would both assist in clearing the contractual environment from the impediments engendered by uncertainty, which would otherwise prevent the parties from realizing the full potential of their collaborative relationship. They would differ, however, in the manner and method by which that objective is attained.

With few exceptions, the literature on breach remedies has focused on the first of these potential strategies, while leaving the second largely unexplored.[1] Preoccupied with treating the byproducts of the disease, it largely neglected the possibility of affecting its incidence. From a modeling perspective, that approach is reflected in the conventional treatment of uncertainty as an exogenous variable, rather than a factor that policy could purposely influence. The presence of uncertainty has informed legal policy, but has rarely been perceived as a target that policy might attempt to control.[2]

The purpose of this paper is to study this second possibility, with relation to the choice of damage measures for breach of contract. More particularly, it sets out to advance two related aims. The first is to characterize the incentive to gather information as a function of the applicable damage measure. In that regard, it finds that investment in information essentially always departs from the welfare-maximizing level regardless of the chosen measure. The second aim is to characterize the parties' choice of a measure, given its impact on the level of uncertainty and, ultimately, on the overall level of welfare. It is shown, in that context, that the welfare-maximizing measure – that is, the measure that generates the utmost welfare when its impact on information is taken into account - will generally *not be selected*. There are various failures, identified in detail below, preventing the parties from pursuing the path that would benefit them the most. Thus, although the losses arising from uncertainty might be heavy, and although those losses could be alleviated by choosing a particular contractual design, the strategic dynamics of contracting prevent them from proceeding in the desirable course.

The model considered in the paper takes the following form. A buyer and a seller contemplate a sale of a commodity in the shadow of uncertainty regarding the

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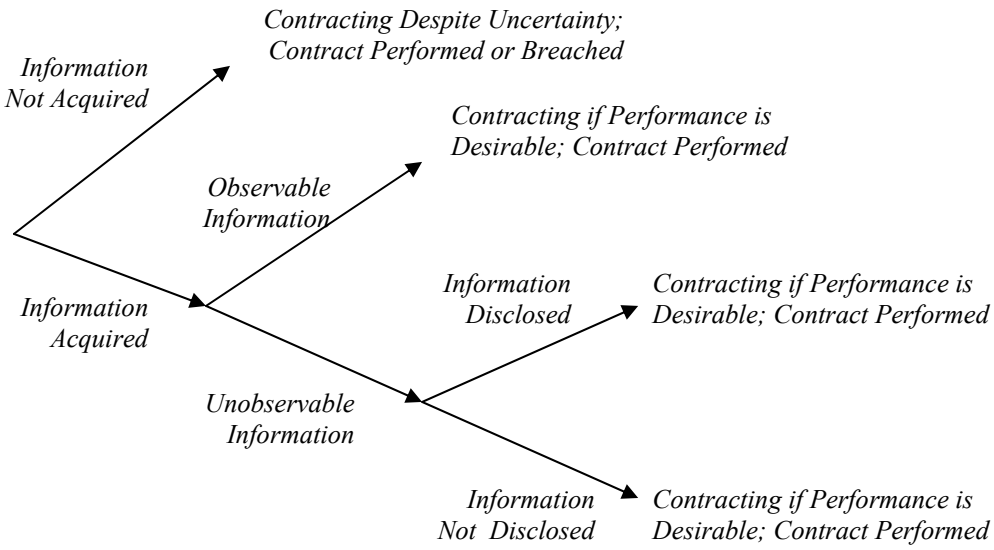
[1] A notable exception is Richard Craswell, *"Precontractual Investigation as an Optimal Precaution Problem,"* 17 J. Legal Stud., 401 (1988). The approach taken here, however, departs from Craswell's in several important respects. See discussion below.

[2] The effect of legal rules on the scope of uncertainty was more systematically considered, however, with regard to the optimal scope of the duty to disclose. See Anthony T. Kronman, *"Mistake, Disclosure, Information, and the Law of Contracts,"* 7 J. Legal Stud., 1 (1978); Jack Hirshleifer, *"The Private and Social Value of Information and the Reward to Inventive Activity,"* 61 Am. Econ. Rev. 561 (1971); ROBERT COOTER & THOMAS ULEN, LAW AND ECONOMICS, 270-76 (3D ED. 2000); Steven Shavell, *"Acquisition and Disclosure of Information Prior to Sale*," 25 RAND J. Econ., 20 (1994).

seller's cost of production. Both parties are assumed to share an initial belief regarding the distribution of the seller's possible costs. The seller, however, may learn his production cost by investing some fixed amount prior to the formation of the contract. In some cases, the buyer immediately observes the information acquired by the seller, whereas in others, the seller obtains information privately and discloses it only if doing so advances his self-interest.[3] The basic structure of the considered model is depicted in Figure 1.

Figure 1: Depiction of the Model



To put some flesh on these two possibilities, consider a contractor who is imperfectly informed regarding the cost of pursuing a construction project, but may acquire the relevant information at a cost. In some cases, the procedure by which information is obtained is such that both the contractor and the landowner observe its results independently. Thus, if, say, the contractor must dig into the land to inspect whether the substance under ground is suitable for construction, the result of the inspection may well be accessible to both parties on an equal basis. If, however, it

[3] In a third category of cases, the seller obtains information privately but cannot disclose it to the buyer in a credible fashion. I briefly comment on the ramifications of this possibility in section V below.

concerns the determination of the contractor's input costs, then the contractor will typically conduct that investigation privately, whereas the landowner will not independently know of its results or even whether it had taken place. Information, in this latter case, would remain unobservable to the landowner, unless affirmatively disclosed.

When information is perfectly observed by the buyer, it is shown that, regardless of the selected measure, information is *under-acquired*. Furthermore, a stark tradeoff is found between a measure's capacity to induce information-gathering and its performance in accomplishing all other, non-informational goals that the parties seek to advance. In other words, the better a measure performs in achieving non-informational objectives (such as an optimal incentive to rely, an optimal allocation of risk, etc.), the weaker is the incentive it creates to gather information. Given this tradeoff, welfare will generally be maximized by striking some balance between the opposing considerations: some weight would be given to the informational objective, and some to non-informational ones. It is shown, however, that – due to strategic behavior – the parties will in fact act as if they accord zero weight to the informational consequences of their chosen measure. That, in turn, will lead them to select an inferior design, leading to loss of welfare. The underlying dynamic generating these results, as well as a possible cure, are discussed at further length below.

These dynamics play out in quite a different form when information acquired by the seller is unobservable to the buyer unless disclosed. It is shown, in that case, that information is either over-acquired or under-acquired, depending on details that are case-specific. In a more restrictive model, which considers the expectation and reliance measures individually, it is shown that the expectation measure systematically leads to an excessive incentive to acquire information, whereas the reliance measure's effect on information may be either excessive or inadequate. Moreover, in this case as well, the parties will often fail to choose the welfare-maximizing measure. The inefficient equilibrium here is predominantly driven by the asymmetry in the parties' information. For reasons explained at greater length in subsequent sections, the parties will have a systematic tendency to select measures of *low-liability* even when more potent ones would maximize welfare.

Section II, which follows next, discusses the relationship of this paper to related literature. Sections III and IV then examine the observable and unobservable

cases respectively. Section V offers a short comment regarding the case in which information is gathered privately and cannot be credibly conveyed to the buyer. Finally, section VI offers some concluding remarks.

II. Relationship to Existing Literature

The topic of breach remedies is one of the most closely examined areas in the scholarship of contract law. Accordingly, the consequences of breach have been shown to affect welfare in a variety of ways.[4] Quite surprisingly, however, the effect of damage measures on the scope of uncertainty has so far received little attention. In this section I briefly review the related literature on this issue and consider its relationship and differences from the present analysis.

Perhaps the most closely-related work is due to Richard Craswell.[5] As in the present paper, Craswell examines a model in which a seller may acquire information prior to contracting, and where the selected damage measure determines his incentive to do so. Craswell specifically analyzes the effect of the expectation and reliance measures on the seller's incentive, and then compares it to the socially optimal level of information-gathering.

The concern of the present paper is different from Craswell's in several major respects. First, the question which concerns Craswell is how alternative measures affect the incentive to acquire information. The present model takes the question a step further: Given the differential effect of alternative measures on information, and

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[4] See, e.g., Steven Shavell, *"Damage Measures for Breach of Contract,"* 11 Bell J. Econ., 466, 468 (1980) (focusing on the effect of alternative measures on reliance and trade in the absence of renegotiations); William Rogerson, *"Efficient Reliance and Damage Measures for Breach of Contract,"* 15 RAND J. Econ, 39 (1984) (similarly examining the effects of alternative measures on trade and reliance when renegotiations are possible); A. Mitchell Polinsky, *"Risk Sharing through Breach of Contract Remedies,"* 12 J. Legal Stud., 427 (1983) (analyzing the effect of damage measure on risk allocation); Kathryn E. Spier & Michael D. Whinston, *"On the Efficiency of Privately Stipulated Damages for Breach of Contract: Entry Barriers, Reliance and Renegotiations,"* 26 RAND J. Econ., 180 (1995) (examining the effect of liquidated damages as an instrument to control reliance and the inefficient exclusion of competitors).

[5] See Craswell, supra note 1.

ultimately on welfare, it asks whether the parties choose the optimal alternative. One's immediate intuition might be that rational parties will select the welfare-maximizing measure, for the familiar reasoning that a maximally-sized pie serves the parties' mutual interest. The analysis suggests, however, that such an intuition would be wrong. Rational parties, taking account of the measure's effect on information will often choose a *dominated* measure, that is, one that produces less value than some other alternative that is available. Moreover, in some cases, the fact that information can physically be acquired leads to lower welfare than if such an option did not exist. The paper identifies this failure as well as its underlying roots.

A second major juncture in which the analyses part ways concerns the modeling assumption regarding the informed party's ability to keep his information private, with the aim of reaping a greater personal gain. In Craswell's model, the power to retain information as private is curtailed by an assumption that the buyer either observes the seller's information perfectly, or holds rational expectations regarding the seller's investment. The present analysis examines the more general case in which the buyer's expectations are not restricted, and, in particular, are not necessarily correct. Such a setting seems highly prevalent, and its effect on the strategic structure of the problem is indeed significant. To be sure, in several important features of the theory, this assumption causes results to be reversed or otherwise fundamentally altered.[6]

In two other related papers, Crémer and Khalil,[7] and then Crémer, Khalil and Rochet,[8] consider a model in which a principal may offer a contract to an agent on a take-it-or-leave-it basis, where the agent may acquire purely strategic information at a cost prior to contracting. These papers seek to characterize the principal's optimal

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[6] The present paper differs from Craswell's in some additional important respects as well. First, the present analysis maintains a more general application of the results by examining a generic damage measure, rather than several specific alternatives (such as expectation and reliance). Moreover, it allows for a general definition of welfare (both private and social), and so is not restricted to a particular set of welfare components. The present model is also somewhat simplified in comparison to Craswell's in that it assumes that acquired information reveals the actual state of the world, rather than merely enhance the probability of a correct choice.

[7] Jacques Crémer & Fahad Khalil, *"Gathering Information before Signing a Contract,"* 82 Amer. Econ. Rev. 566 (1992).

[8] Jacques Crémer et al., *"Strategic Information Gathering before a Contract is Offered,"* 81 J. Econ. Theory, 163 (1998).

strategy in that setting. Their analysis differs from this in that the present model examines a case where information is acquired not only for strategic purposes, but rather for a potential combination of strategic and productive objectives. Moreover, it considers the effect of alternative damage measures on the incentive to obtain such information; and finally, it assumes that bargaining power does not lie exclusively with the principal, but is rather shared between the parties. As the analysis unfolds, it will be evident that the assumption of incomplete bargaining power carries some significant implications.

Another related paper is that of Mezzetti and Tsoulouhas, who examine the case of an informed principal seeking to encourage an uninformed counterpart to invest in learning the principal's privately-known type.[9] Their analysis, therefore, essentially addresses the principal's problem of credibly conveying private knowledge by inducing the agent to spend resources to obtain it. Thus, both papers consider the effect of contract design on the incentive to acquire information. Their emphasis, however, is quite different. Whereas Mezzetti and Tsoulouhas examine a setting in which the principal holds private information he wishes to credibly transmit to the agent, in this paper information is initially symmetric, but the seller hopes to improve his position by gathering information he will often prefer to retain as private. Furthermore, their analysis considers neither the effect of alternative legal regimes on the incentive to invest in information-gathering, nor the implications of shared bargaining power.

Finally, Anke Kessler examines the case of an agent holding exclusive access to private information but can commit to remain ignorant. Kessler shows that in such a setting, the agent's commitment to ignorance affords her a strategic advantage. Ignorance is thus embraced by the agent even when information may be obtained at no cost at the margin.[10] This paper, in contrast, rules out the possibility of such a commitment. As a result, ignorance, in this model, no longer generates such a benefit.

Let us therefore turn to a more detailed description of the model contemplated here.

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[9] Claudio Mezzetti & Theofanis Tsoulouhas, *"Gathering Information before Signing a Contract with a Privately Informed Principal,"* 18 Int. J. Ind. Organ., 667 (2000).

[10] Anke Kessler, *"The Value of Ignorance,"* 29 RAND J. Econ.,339 (1998).

III. The Model

General Structure

A buyer and a seller consider entering into a contract for the sale of a single unit of a good, say a widget. The cost of producing the widget is given by $c(\cdot)$, where the dot represents various potential determinants of the seller's reservation value, such as available reliance opportunities, his exposure and sensitivity to risk, input prices and available technology. c is initially uncertain, and lies within the interval $[\underline{c},\bar{c}]$, where $0 < \underline{c} \leq \bar{c} < \infty$. *f(c)* is the strictly positive and differentiable density of *c*, and is assumed to be common knowledge. Accordingly, *F(c)* is the corresponding cumulative distribution function (cdf).

The buyer's valuation of the widget is denoted $v(x,\cdot)$, where x is the cost the buyer incurs in reliance of the contract, and the dot represents additional potential determinants of his valuation, such as his exposure to risk. It is assumed that regardless of the value of x, $\underline{c} < v(x,\cdot) < \bar{c}$, so that contracting is ex post desirable for some cost values but not for others.

The parties, however, do not necessarily base their contracting decision merely upon the exogenously given prior *f(c)*. In particular, the seller may acquire information at the cost of $I > 0$, which will reveal the actual production cost.[11] I is known to the seller with certainty, whereas the buyer merely observes a distribution of possible information costs. Furthermore, both parties acknowledge that the buyer has no independent access to similar information, but at prohibitive cost.[12]

When the seller acquires information, two possibilities are explicitly considered: one in which the discovered cost becomes immediately observable to the buyer; and a second, in which the buyer initially does not observe the acquired information, but may learn it upon the seller's disclosure. I refer to these two options

[11] It is assumed here that information results in definite revelation of the cost of production. It could be alternatively assumed, without impact on any of the qualitative results, that information reveals the cost only probabilistically. Namely, results would remain intact if upon the gathering of information it were revealed that some particular *c* would be realized with probability *q* while all other possible costs would be realized with probability *(1-q)f(c)*.

[12] This assumption thus excludes the possibility of duplicative effort in the search of information.

as the observable and unobservable cases respectively. A third option, in which information is acquired and cannot be credibly disclosed, is briefly considered in section V.

The sequence of moves is modeled as follows:

- *Period 1*: The seller chooses whether to acquire information;
- *Period 2*: The parties negotiate a contract or part ways. A contract specifies a price and a damage measure.
- *Period 3*: If a contract had been formed, the parties engage in relationship-specific reliance investments.
- *Period 4*:
  - If information had earlier been acquired, the seller performs (note that, given information and a voluntary decision to contract, it is always privately optimal for him to do so.)
  - If information had not been earlier acquired, the seller's cost of production is naturally revealed at no cost. Accordingly, the seller then chooses performance or breach. If he breaches, he pays damages to the buyer according to the agreed-upon measure. If there are gains to be made from trade following breach, the parties may either renegotiate a new contract, or refrain from doing so if transactions costs are prohibitive.

The parties' welfare is affected by information in various possible ways. One major impact concerns the parties' reliance. If information reveals that trade cannot create a surplus, the parties desirably refrain from sinking reliance into the inauspicious relationship; and if it reveals that a surplus is attainable, it induces them to set the level of reliance more efficiently then if no information were provided. Furthermore, information eliminates risk, and thereby relieves the parties from the costs of risk-bearing; and if it confirms the desirability of trade, it relieves them of the subsequent need to undertake precautionary actions that will lower the probability of

non-performance. Hence, the social value of information potentially consists of several components, whose magnitude and relative importance will vary from one situation to the next. To preserve the generality of the analysis, no particular assumption is made with respect to the composition of that value. The only assumption made in this regard is that the value is positive.

The private incentive to gather information will depend, in part, on the applicable damage measure for breach. The applicable measure is chosen from a set $D = \{d_1, d_2, ..., d_n\}$, where each $d_i \in D$ satisfies $d_i \geq 0$. Each d_i may be either a real number or a function of other variables. As mentioned, each damage measure may generate a different effect on welfare, namely by its effect on reliance, risk-bearing costs, precautionary incentives, etc. Denote by $w_I(d_i)$ the *expected* level of welfare induced by damage measure d_i if it is known that information will be acquired at some future period. Let $w_{NI}(d_i)$ be defined similarly for the case in which it is known that information will not be acquired in the future. Accordingly, let $R_I(D)$ denote a complete welfare-based ranking of the measures in *D* for the case where information will be acquired, and let $R_{NI}(D)$ be similarly defined for the case in which information will not be acquired.

As it is assumed that information can never reduce the parties' overall welfare, $w_I(d_i) \geq w_{NI}(d_i)$ for all $d_i \in D$. Thus, for each $d_i \in D$, there exists a magnitude $e_S(d_i) \geq 0$, representing the efficiency gain arising from information, such that $e_S(d_i) = w_I(d_i) - w_{NI}(d_i)$. This assumption primarily excludes the possibility that the parties are risk-seeking, and therefore gain utility from uncertainty as such. Similarly, $e_P \geq 0$ denotes the value the seller privately derives from information.

Bargaining is modeled as follows. When the seller's cost of production is either observable or voluntarily disclosed, the seller is assumed to extract a fraction of $\theta \in [0,1]$ from the joint expected surplus, whereas the buyer captures the remaining fraction of $1-\theta$.

When information is unobservable and the seller is silent, the bargaining procedure is somewhat more complex. In the eyes of the buyer, the seller in this setting might be one of two types: he could either be an uninformed seller; or he could

be an informed seller who seeks to pool with the uninformed, so as to gain a price advantage. For present purposes, it is not necessary to specify the particular price that bargaining leads to in these circumstances. It is merely assumed that the price lies within a range that sustains the unobservable nature of information.[13]

Finally, I assume that when information is not acquired, the social expected value from trade remains positive. The reason this assumption is made is that only in that setting the nature of the breach remedy is of consequence. To see why, observe that if it were otherwise, contracting would only occur if the seller had acquired information prior to the moment of contracting, and had found trade to be efficient. Under such circumstances, however, breach would never occur in equilibrium, and hence the legal consequences of breach would be immaterial. As the purpose of the analysis is to examine the impact of alternative damage measures on information, it is thus assumed that a contract may be formed even when the seller is uninformed.

IV. Observable Information

To begin the substantive analysis, let us initially assume that the information acquired by the seller is perfectly observed by the buyer. This section, devoted to the examination of that setting, develops several results. First, it is shown that information is under-acquired regardless of the applicable damage award. Second, it is shown that there exists a tradeoff between a measure's capacity to induce information-gathering and its performance in other respects. Namely, the better a measure fares when information is not acquired, the poorer its effect on the seller's incentive to acquire information. In the balance between these competing considerations, social welfare will sometimes be served if the informational objective takes precedence. However, in those cases, the remedy which secures this interest will never be actually chosen.

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[13] The following two conditions, necessary for the pooling effect to succeed, define the range within which the price must fall:

(i) The price cannot exceed the amount that would be charged by a seller *known* to be uninformed. If it were otherwise, pooling could not be an optimal strategy for the informed seller.

(ii) The price must be set high enough so as to satisfy the uninformed seller's participation constraint. If it were otherwise, pooling would not be possible as the buyer would rationally infer that the seller is informed.

These results, and their underlying reasons, are next explained in more detail.

Inadequate Information-Gathering

Consider first the observation that, regardless of the damage measure, information generates more social value than a private gain to the seller. This point is established by the proof to the following proposition.

Proposition 1: $e_P(d_i) = \theta e_S(d_i)$ for all $d_i \in D$. In words, the seller's incentive to invest in information is inadequate, and is equal to a portion of θ of the social value of information.

Proof: The derivation of this result is straightforward. When information is not acquired, the social welfare associated with measure d_i is $w_{NI}(d_i)$. The seller's bargaining power allows him to capture merely a portion of θ from that surplus, so that his private gains from contracting are $\theta w_{NI}(d_i)$. Conversely, when information is gathered, the seller's share of the surplus rises to $\theta w_I(d_i)$. Thus,

$$e_P(d_i) = \theta\left(w_I(d_i) - w_{NI}(d_i)\right), \tag{1}$$

which is, by definition, equal to $\theta e_S(d_i)$. W

This result is a species of the well-known holdup problem. The seller bears the full cost of investment in information, but through the process of bargaining, collects only a fraction of its return. The problem is due to the sunk nature of the seller's investment: by the time the parties reach the contracting stage, information has already been produced and observed, and hence the seller cannot credibly threaten to withhold the benefits of information unless the buyer shares in its cost. As the seller expects this dynamic to ensue, he thus invests only if his own fraction of the investment's return exceeds the investment's full cost.

Note that the extent of inefficiency is negatively related to the seller's bargaining power. The greater the seller's fraction of the benefit, the smaller is the divergence between the investment's private and social value. Only in the extreme case, in which the seller carries the entire bargaining power, do the two become perfectly aligned.

Informational versus Non-Informational Functions of Damage Measures

As is well acknowledged by existing literature, damage measures affect a variety of choices and incentives. Accordingly, different damage measures impact those choices and incentives in different ways. Thus, for instance, if a measure produces a desirable incentive to trade, it may generate an inferior allocation of risk, or create a problem of over-reliance.[14] The globally optimal measure that rational and informed parties will ultimately choose is one that generates the most welfare, in view of the aggregate balance of its various strengths and weaknesses. There is typically little one can say a-priori about the attributes of this optimal balance. It depends in large part on specific circumstances, tastes and preferences, which cannot be meaningfully generalized.

This section, however, identifies one form of regularity in the comparison between different damage measures, pertaining to the present issue at hand. Namely, the following proposition suggests that there exists a built-in tradeoff between a measure's effect on information and its effect on *all other considerations combined*. More precisely, it implies that if we imagine a world in which information cannot be acquired, and identify a particular measure as optimal in that world, then it must be the case that in a world where information can be acquired, that measure generates the *least* incentive to acquire information among all possible alternatives. That result, in turn, suggests that the balancing problem is likely to be a serious one. Returning to the medical analogy, it implies that the strategy that best treats the disease once one is infected is also the one *maximizing* its incidence. And similarly, the treatment minimizing the probability of infection is also that which performs most poorly if one is eventually affected. Unlike the medical analogy, however, in the contractual

[14] See the various sources cited in note 4, supra.

context one cannot pursue both strategies in parallel, as one cannot select one measure for the purpose of information-gathering and another for all other purposes, within the same contract. The tradeoff therefore presents a potentially severe loss of efficiency, as established more formally in Proposition 2.

Proposition 2 Consider any two measures $d_i, d_j \in D$. d_i produces more welfare than d_j when information is not acquired, if and only if d_j generates a stronger incentive for information gathering than does d_i. Using notation,

$$w_{NI}(d_i) \geq w_{NI}(d_j) \Leftrightarrow e_P(d_j) \geq e_P(d_i). \tag{2}$$

Proof: Let us assume momentarily that $w_I(d_i) = w_I(d_j)$ for all $d_i, d_j \in D$, which amounts to saying that w_I is in fact independent of the damage award. Given that assumption, the following is necessarily true:

$$w_{NI}(d_i) \geq w_{NI}(d_j) \Leftrightarrow w_I(d_j) - w_{NI}(d_j) \geq w_I(d_i) - w_{NI}(d_i), \tag{3}$$

which is to say that:

$$w_{NI}(d_i) \geq w_{NI}(d_j) \Leftrightarrow e_S(d_j) \geq e_S(d_i). \tag{4}$$

Recall from proposition 1 that $e_S(d)$ is a positive linear transformation of $e_P(d)$ for any $d \in D$. It therefore follows that:

$$w_{NI}(d_i) \geq w_{NI}(d_j) \Leftrightarrow e_P(d_j) \geq e_P(d_i), \tag{5}$$

which is the desired result. To complete the proof, it thus remains to be shown that, indeed, $w_I(d_i) = w_I(d_j)$ for all $d_i, d_j \in D$. The reasoning is as follows: when information is gathered, the parties contract if and only if $c < v$ and select a

price $p(d_i) \in [c(d_i), v(d_i)]$. It follows that when an informed seller enters into a contract, he performs always, as his gains from performance $p(d_i) - c(d_i) \geq 0$ whereas his benefit from breach is $-d_i \leq 0$. But as breach thus does not occur in equilibrium, the particular level of the damage measure has no impact on the ultimate level of welfare. The variables comprising w_I are thus all independent of d_i. W

Inefficient Choice of Damage Measure

Given the above-stated tradeoff between informational and non-informational objectives that a measure might advance, it follows that for a measure to be welfare maximizing, it must strike an *optimal balance* between these competing goals. It is next shown, however, that rational parties, selecting a measure free of any external restraints, do not actually shape their choice according to such a balancing paradigm. In fact, the parties act as if the informational objective is accorded *no weight whatsoever* in their decision, while the competing, non-informational goals, are accorded the entire weight. The parties may thus find themselves in an inefficient equilibrium, where the measure selected in fact is dominated by a feasible, yet unchosen alternative.

The root of the problem lies with the sequential nature of information-gathering and contracting. When the decision is made whether to acquire information, the seller acknowledges that if he does not become informed, the parties will select the measure that tops the ranking $R_{NI}(D)$. By Proposition 2, that is the measure which yields the weakest incentive ex ante to become informed, relative to all possible alternatives. Moreover, that incentive is clearly inadequate, as by Proposition 1, all measures produce an inadequate incentive in the observable case. It follows that there will clearly be instances in which investment in information could enhance overall welfare, but the seller would fail to take it. It is also clear that if a different measure would govern in the absence of information, the seller's incentive to invest would rise, in some cases sufficiently to induce him to invest. The possibility that such a superior measure would govern, however, is off the equilibrium path: as contracting occurs only after the seller's decision is made, at the moment of contracting the parties are already too late, and can no longer affect the incentive to

invest. Information is by then viewed as given, and hence at that point the parties can do no better than to assign the entire weight of the decision to considerations that are not information-related. The selected measure is therefore indeed the one that tops the ranking $R_{NI}(D)$, regardless of whether it maximizes welfare or not.

This result is next established more formally as Proposition 3.

Proposition 3:

(i) There exist cases in which d_j is the welfare-maximizing measure, although it is not the measure that tops the ranking $R_{NI}(D)$.

(ii) In all such cases, d_j is *never* actually chosen.

Proof:

Let d^* denote the measure that tops the ranking $R_{NI}(D)$. By Proposition 2, it must yield the least private return for investment in information among all possible measures. It follows that if the acquisition of information is efficient, that is, $w_I - I \geq w_{NI}(d^*)$, then a measure situated lower in the ranking $R_{NI}(D)$ could well produce greater welfare than d^*. Namely, when $I > \theta\left(w_I - w_{NI}(d^*)\right)$, and therefore information is not acquired under d^*, there might well exist some measure $\hat{d} \in D$ for which $I < \theta\left(w_I - w_{NI}(\hat{d})\right)$. As $\hat{d}$ would thus induce information-gathering, it would ultimately generate greater welfare than d^*.

As explained above, however, if at the moment of contracting information had not been gathered, the parties would act irrationally if they opted for a measure such as $\hat{d}$ rather than d^*. Thus, anticipating the choice of d^*, the seller fails to acquire information, and welfare, as a result, is not maximized. W

Hands-Tying Provisions – A Solution?

The inefficiency discussed in the section above stemmed from the premise that the parties cannot contract over an activity that takes place prior to the time of contracting itself. At least on its face, this would seem a questionable premise. After

all, if a mutually beneficial action must be taken at an earlier point in time, why can't the parties enter some contractual arrangement at that earlier point? This section therefore examines this assumption more closely. It finds that indeed one could characterize a contractually-based solution that would allow the parties to escape the timing problem. As will be seen, however, its practical viability rests on somewhat shaky ground.

The preliminary agreement that we seek to identify is one that allows the parties to "tie their hands", and thereby effectively contract over the precontractual.[15] The underlying method by which this could be done is quite simple. Suppose that the seller must decide whether to invest in information, but – using the notation of the previous section – he would efficiently invest only under d' but not under d^*. Suppose further that at that point in time, the parties may enter a preliminary, contingent agreement, stipulating that if a contract were later formed for the trade of the widget, d' would be the selected measure. The preliminary agreement would thus serve as a form of commitment, obligating the parties to favor d' over d^* even though they know that if information is not gathered by the time they contract, d^* would be mutually preferred.

Let us consider the dynamic of this arrangement by way of backward induction. Assuming that, pursuant to the preliminary agreement, the primary contract can only be formed with a measure of d', the seller is induced to acquire information.

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[15] Similar efficiency benefits of hands-tying arrangements have also been identified in the related contexts of contract modification and age discrimination in employment relationships. See Christine Jolls, *"Contracts as Bilateral Commitments: A New Perspective on Contract Modification,"* 26 J. Legal Stud. 203 (1997); and Christine Jolls, *"Hands-Tying and the Age Discrimination in Employment Act"* 74 Texas L. Rev., 1813 (1996). The following example, offered by Jolls, clarifies the gist of the hands-tying insight. A landowner and a sharecropper consider forming a contract. The sharecropper is more averse to risk than the landowner, but an optimal contract would nevertheless have him bear some of the risk, so as to induce him to take greater effort in planting and cultivating the land. After the contract is formed, and the sharecropper commences in his work, there comes a point in time in which he completes his role, and the ultimate realization of value depends only on some exogenous variables, unrelated to his efforts (e.g., the amount of rain). At that point, both parties could benefit if the contract were modified, such that the risk were reallocated back to the landowner, in return for a price. However, if the sharecropper expects this modification to ensue at the outset, then the original contract would no longer produce the desired incentive. Thus, to retain the desirable effect of the original contract, the parties must commit not to modify the agreement, even by mutual assent.

Once information is acquired, the cost of production is revealed, and the parties either contract at a price that renders the agreement mutually beneficial, or part ways, if, given the prohibitive cost, no such price exists. In this game, therefore, breach is off the equilibrium path, and $d^{\%}$ is never actually awarded. Nevertheless, for this scheme to produce its desirable effect, the seller must genuinely believe that if breach *were* to occur, $d^{\%}$ would indeed be applied. Otherwise, he would opt to remain uninformed, anticipating that the measure eventually chosen would be d^*.

It is straightforward to observe that such a commitment could benefit both parties at the preliminary stage. Namely, it would confer a benefit to the buyer by the magnitude of $(1-\theta)\left(w_I - w_{NI}\left(d^*\right)\right)$, while imposing a cost on the seller of merely $\theta\left(w_I - w_{NI}\left(d^*\right)\right) - I$. A mutually beneficial contract could then be struck whenever $w_I - I > w_{NI}\left(d^*\right)$, that is, if and only if information-acquisition is efficient. Hence, by entering a contract, in which the buyer pays some agreed-upon price in return for a mutual commitment to select $d^{\%}$ in a future contract, the parties can improve their mutual well-being and generate efficient acquisition of information.

Two major hurdles, however, may keep this solution from being used in practice. The first obstacle concerns the asymmetry in the parties' information regarding I. As the buyer observes I only probabilistically, he may often not be able to verify that a preliminary agreement is indeed necessary to induce the seller to invest. In other words, he may well believe that even under d^* information would be acquired, and if that is so, a preliminary agreement would be unnecessary to secure the acquisition of information. Furthermore, even if he does acknowledge the need for a preliminary agreement, his inability to determine the cost of information, might cause bargaining over the preliminary agreement to break down. The solution is therefore feasible only when the buyer's information regarding I meets a substantial degree of accuracy.

The second obstacle lies in the fact that, under current contract doctrine, hands-tying provisions are not legally enforceable. According to the existing legal conception, the principle of contractual freedom requires unhindered recognition in the parties' ability to modify agreements by mutual assent (provided that the

consideration requirement is observed.)[16] This rule indeed captures the intuitive notion that, in the general case, a contract modifying a previous agreement is likely to generate a Pareto improvement, or otherwise it would not be struck. Thus, by embracing a rule that refuses to enforce such a modified agreement, one may well curtail a desirable move, without advancing any countervailing interest. However, this underlying rationale, although compelling in the general case, is inapplicable to the present setting. In fact, as explained above, refusal to enforce the preliminary agreement would *thwart* a Pareto improvement, as it would deny the parties the option of undertaking a mutually beneficial commitment. Such a commitment is needed, since only by preventing the fulfillment of ex post interests, can the parties maximize their overall welfare. Accordingly, by voiding it, one causes welfare to fall, without serving any competing aim.

The rule, however, remains a part of existing contract doctrine. Therefore, as long as it remains good law, the hands-tying scheme is not a workable instrument the parties can actually employ in practice.

IV. Unobservable but Certifiable Information

The premise underlying the analysis thus far has been that the buyer perfectly observes any information acquired by the seller. In many actual cases, however, the party gathering information is able to control its conveyance to his counterpart. If retaining it as private serves his interests, he may keep it to himself; and if he can negotiate more favorable terms by sharing it with his partner, he may credibly disclose it. This section now turns to examine the dynamics of information gathering within such an environment.

Under what conditions would a seller choose to disclose information voluntarily? Disclosure is beneficial to the seller when it induces a rise in price, relative to what it would be in the absence of disclosure. The price, in turn, rises with the cost of production. It follows that the decision whether to disclose depends on the

[16] See Restatement (Second) of Contracts § 311 cmt. a (1979); Zumwinkel v. Leggett, 345 S.W.2d 89, 93-94 (Mo. 1961); Davis v. Payne & Day, Inc., 348 P.2d 337, 339 (Utah 1960); Beatty v. Guggenheim Exploration Co., 122 N.E. 378, 387-88 (N.Y. 1919), and Jolls (1997), supra note 15, at 204-209.

seller's finding of his true cost: if it surpasses a certain threshold level, he uses disclosure as an instrument by which he can bargain for a higher price; and if it lies below the threshold, he keeps the information to himself, so as to avoid a fall in price.[17] Let us denote the threshold value by c^*.

For the analysis to be meaningful, one additional point must be noted. It is that the statement that information is "unobservable" should be understood as implying not merely that the buyer cannot independently verify the *result* of the seller's investigative effort, but also that he cannot discern whether such an effort had *at all been exerted*. To see why this is analytically required, suppose, by way of contradiction, that the buyer knew that the seller was informed but did not know her discovered cost. Given the seller's silence, the buyer would then rationally infer that the realized cost is lower than c^*. Having ruled out the possibility of $c \geq c^*$, his beliefs regarding the seller's true cost would therefore be updated downwards. Accordingly, the maximum price he would be willing to pay in the absence of disclosure would fall. But of course in that case, the threshold above which disclosure would benefit the seller would also fall to some value $c^{**} < c^*$. However, if the seller remains silent nevertheless, the buyer would reason that the true cost must lie even below c^{**}. That, in turn, will cause the buyer to revise his beliefs downwards once more, and once again lower the maximum price he would pay in the absence of disclosure. This process would be iterated further until the threshold level would fall sufficiently so as to induce the seller to disclose his true cost. Information therefore has an unraveling quality: if the buyer knows that information is held by the seller, he must eventually also know its content.[18] Hence, to allow for information to remain

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[17] The particular threshold value will depend on the price that would govern in the absence of disclosure. That, in turn, will primarily depend on the average cost of production (given that information is not acquired), and on the buyer's beliefs regarding the cost of information.

[18] This insight is due to three separate papers which appeared at around the same time. See Sanford Grossman and Oliver Hart, *"Disclosure Laws and Takeover Bids,"* 35 J. Finance, 323 (1980); Paul Milgrom, *"Good News and Bad News: Representation Theorems and Applications,"* 12 Bell J. Econ., 380 (1981); and Sanford Grossman, *"The Informational Role of Warranties and Private Disclosure of Product Quality,"* 24 J. Law & Econ., 461 (1981). For a non-technical survey, see Robert Gertner, *"Disclosure and Unraveling,"* in 1 THE NEW PALGRAVE DICTIONARY OF ECONOMICS AND THE LAW, 605 (Peter Newman ed., 1998).

unobservable in equilibrium, it is assumed that the buyer not only fails to observe the outcome of the seller's investment, but also whether the seller is at all informed.

Information Acquisition

In the observable case, it was seen that the seller's incentive to acquire information is inadequate regardless of the damage measure, or any other variation in case-specific circumstances. Such a general conclusion is no longer obtained when information is unobservable. Namely, as is shown next, the seller's private gains from information may be either higher or lower than its social value, depending on the particular distribution of production costs, the parties' relative bargaining power, or the applicable damage measure.

This disparity in results emanates from the effect of the acquired information on the parties' relative bargaining strengths. In the observable case, the parties' bargaining abilities remains constant under both informational settings: whatever share the seller captures from the surplus in general, he also extracts from the addition in surplus created by the availability of information. It is for that reason that his private gains from information always falls short of its social value: unless his bargaining power is complete, he privately captures only some of the joint gains that information engenders, while bearing its cost in full.

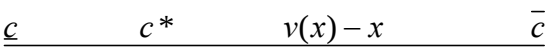
That essential property of the observable case no longer holds when information is unobservable. In that case, information is privately beneficial not only in that it allows the seller to capture a fixed share of the added surplus, but also in that *it enlarges his apportioned share*. In some cases, as will be shown, his private gains from information may even exceed its social value. The scale of that effect may be either small or large, so that the seller's ultimate incentive to invest may either remain inadequate or become excessive. The determinants of the eventual result are explained next.

When the decision whether to acquire information is made, the function $f(c)$ determines the range of possible costs. Let us divide this distribution to several segments. In different segments, it is shown that the seller's private benefit from information departs from the corresponding social value *in possibly different directions*. That, in turn, implies that the ultimate effect of a damage measure in each segment depends, *inter alia*, on the probability mass allotted by $f(c)$ to that segment.

As will become apparent, it will also depend on the seller's bargaining power and on the level of liability.

Consider therefore a division of the cost range, as depicted in Figure 2.

Figure 2: Division of the Cost Range



Consider first the segment of $\left[\underline{c}, c^*\right]$. That is the only segment in which the private and social optima perfectly converge. As $c \le c^*$, the seller remains silent, and information generates an efficiency advantage only inasmuch as it affects his own utility. Thus, for example, information might allow him to beneficially expand his level of reliance, or to refrain from wasteful investment of resources in precautionary conduct. It might also eliminate his risk-bearing costs if he is risk averse. As such benefits are entirely internalized by the seller, the private and social gains from information remain aligned.

This is no longer the case if the cost falls within the segment of $\left[c^*, v(x)-x\right]$. Within that range, the seller discloses his discovered cost and the parties proceed to contract. Since information is then mutually observable, *both* parties are favorably affected by the availability of information. The seller captures only a fraction of this benefit, by a magnitude corresponding to his bargaining power. That, in isolation, would generate the already familiar result of under-investment. However, there is also an additional force in play, which counteracts that effect. It is that disclosure allows him to charge a higher price. The ultimate result is thus derived by the relative significance of these countervailing effects. Investment will tend to remain too low when the efficiency gains carry substantial weight, for instance, when the buyer is highly risk averse, or when reliance is significantly affected by information. Likewise, it will tend to remain inadequate if the seller's bargaining position is weak, and so his share of the efficiency gain is low. On the other hand, the incentive might become excessive if the seller has much to gain price-wise from disclosure. In particular, that might occur if the variance of possible costs within the segment is substantial.

Finally, consider the segment $\left[v(x)-x,\bar{c}\right]$. When the discovered cost lies within that range, trade is undesirable altogether. Whenever information is available, therefore, the parties simply forgo the contractual plan. The efficiency gain of information in this case lies within the range of $\left[0,x\right]$, depending on the realized cost. The corresponding private gain of the seller, however, lies within the range of $\left[0,d\right]$.[19] Thus, for sufficiently high levels of d the private value of information exceeds its social value, while the converse is true for sufficiently low values of d.[20]

These general observations suggest that the ultimate incentive to invest in information may well depend on the applicable damage award, as well as on other elements of rather idiosyncratic nature. Given the case-specific forces that may affect this result, there is little one can say about the properties of the socially optimal measure. One can say more, however, about the attributes of any particular measure. In the next sub-section, I therefore turn to consider information gathering with specific reference to measures of special importance, namely those of expectation and reliance.

Specific Analysis: The Expectation and Reliance Measures

In the realm of legal policy, the measures of expectation and reliance occupy a unique status. Their prominence stems first and foremost from their prevalence, as the measures most commonly applied by courts when the parties fail to stipulate a different preference. In addition, theoretical work suggests that they carry important virtues, rendering them likely candidates for the parties' true will.[21] This section is therefore dedicated to an individual analysis of these two distinctive measures.

The framework I use for this analysis is somewhat more restricted from that considered above, and is described as follows. The parties are interested in the nature

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[19] Or more precisely, if $p+d>v(x)-x$, the lower endpoint of the range would equal $\left(v(x)-x\right)-p$.

[20] Moreover, in some settings, information confers an additional distributive advantage to the seller. Namely, when $p<v(x)-x<c<p+d$, an uninformed seller performs at a loss of $c-p$, whereas an informed seller simply refuses to contract.

[21] See Shavell, supra note 4.

of the damage measure inasmuch as it affects their trade and reliance decisions. Under the expectation measure, the promisee is entitled to the amount that would situate him at the position he would occupy *if the contract were performed*. Thus, in the context of the model, where the promisee is the buyer, it is given by $v(x)-p$. Under the reliance measure, in contrast, damages restore the promisee's position to what it would be *if the contract were never formed.* Hence, in the context of the model, it equals his reliance cost of x. The scope of reliance investments is unverifiable by a third party (e.g., to a court), and is therefore non-contractible. For simplicity, it is assumed that the buyer alone may invest in reliance.[22] Reliance is assumed to enhance the buyer's valuation of the widget at a decreasing rate, so that $v'(x)\geq 0$ and $v''(x)\leq 0$. Otherwise, all features of the analysis in previous sections remain intact.

Expectation Damages

As mentioned above, efficiency in this model is a function of the parties' choices of performance and reliance. I begin by examining the effect of the expectation measure on those choices, with and without information. Subsequently, I turn to derive the private and social gains from information, and proceed to examine their relation.[23]

Seller's Incentive to Perform/Contract: Absent information, the expectation measure induces the seller to perform if and only if trade is ex post efficient, that is, when $c\leq v(x)$. To see this, observe that the seller's gain upon performance is given by $p-c$, whereas his liability for breach equals $v(x)-p$. Hence, performance is chosen if and only if $p-c\geq -(v(x)-p)$, or equivalently, whenever $c\leq v(x)$.

If, conversely, information is acquired, the seller's trade decision is modified. As the seller is aware, the price the buyer is willing to pay cannot exceed $v(x)-x$, for if the buyer agreed to pay such a price, his expected gains would surely be negative. It

[22] If the seller did invest in reliance, he would fully internalize the effect of information on his own investment return. Hence, the relation between the private and social benefit from information does not depend on that assumption.

[23] The effect of the expectation measure on choices of trade and reliance under uncertainty has originally been derived in Shavell, supra note 4.

follows that if the cost of production is found to exceed $v(x)-x$, an agreement is not struck. Accordingly, contracting occurs if and only if $c < v(x)-x$.

Buyer's Choice of Reliance: The expectation measure guarantees the promisee a fixed payoff of $v(x)-p-x$, regardless of whether the contract is performed. Hence, the reliance level maximizing that payoff is given by the first-order-condition, $v'(x)=1$.[24]

Social Value of Information: Denoting by $I^{S}_{\exp}$ the social value of information under the expectation measure, it follows from the foregoing that

$$I^{S}_{\exp}=\left[\int_{\underline{c}}^{v(x_2)-x_2}\left(v(x_2)-c-x_2\right)f(c)dc\right]-\left[\int_{\underline{c}}^{v(x_2)}\left(v(x_2)-c\right)f(c)dc-x_2\right] \qquad (6)$$

where the two expressions between the square brackets represent social welfare with information and without it respectively, and where x_2 denotes the reliance level for which $v'(x)=1$.

Private Value of Information: The seller's private value from information is likewise derived as the difference between his private gains with information and without it. Denoting that value by $\bar{I}^{P}_{\exp}$, it follows that:

(7)

$$\bar{I}^{P}_{\exp}=\left[\int_{\underline{c}}^{c^*}(p-c)f(c)dc+\int_{c^*}^{v(x_2)-x_2}\theta\left(v(x_2)-x_2-c\right)f(c)dc\right]-\left[\int_{\underline{c}}^{v(x_2)}(p-c)f(c)dc-\int_{v(x_2)}^{\bar{c}}\left(v(x_2)-p\right)f(c)dc\right]$$

Or, in rearranged form,

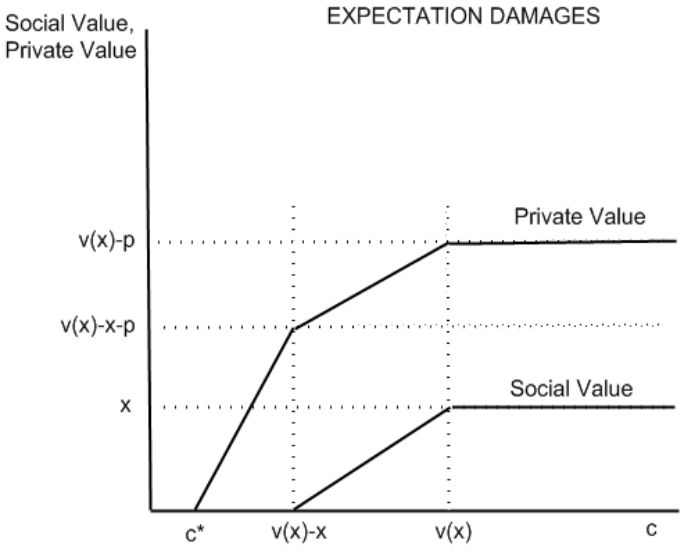
[24] Note that the price of *p* is also a function of the reliance level *x*, but the buyer does not choose his level of reliance based on its effect on price. The reason is that the reliance investment is unverifiable (and therefore non-contractible), and it is made only after the contract is formed. Thus, at the time of reliance, the buyer cannot attain a favorable advantage in price by altering his level of investment.

(8)

$$\bar{I}^{P}_{\exp} = \int_{v(x_2)}^{\bar{c}} \big(v(x_2) - p\big) f(c)dc + \int_{v(x_2)-x_2}^{v(x_2)} \big(c - p\big) f(c)dc + \int_{c^*}^{v(x_2)-x_2} \Big[\theta\big(v\big(x_2\big) - x_2 - c\big) - \big(p - c\big)\Big] f(c)dc$$

Excessive Incentive to Invest: Comparing the private and social values of information, it is next observed that the seller is systematically willing to spend more on information than its contribution to social welfare. This result, based upon equations (6) and (8) above, is illustrated graphically in Figure 3.

Figure 3: Social versus Private Value of Information under the Expectation Measure



From a social perspective, information is valuable in two ways.

(1) When $c > v(x)$, trade does not occur ex post, as the buyer loses more if he performs than if he breaches. In those states, foreknowledge allows the buyer to avoid the wasteful reliance investment of x.

(2) When $c \in [v(x)-x, v(x)]$, trade is efficient ex post (as $c \le v(x)$), although the net value from contracting is negative (as $c \ge v(x)-x$). Advance information thus allows the parties to avoid a net loss of $c-(v(x)-x)$;

In both these respects, the private value of information exceeds the social value. Namely, in the instances in which trade is ultimately not consummated, information saves the seller not merely the cost of x, but rather the higher value of the buyer's expectation ($v(x)-p$). Similarly, when the cost falls within the range of $[v(x)-x, v(x)]$, the seller's private benefit from information reaches $c-p$, which exceeds the social gain of $c-(v(x)-x)$.

Moreover, the seller captures a private gain even in states where information yields no social gain whatsoever. Namely, observe that within the range of $[c^*, v(x)-x]$, information produces no social value. The reason is that neither trade nor reliance are affected by the seller's information: reliance is not affected because x_2 is the buyer's optimal level regardless of the seller's investment; and likewise, trade would have occurred with information or without it, as the cost of production is sufficiently low to allow for a positive contractual surplus. But although the overall value of contracting remains unchanged, the buyer captures a positive gain from information within this range. For as the realized cost exceeds c^*, disclosure of the discovered cost allows him to extract a higher price in bargaining.

It transpires that, when trade and reliance are the primary issues of concern, the expectation measure generates systematic over-investment in information. Note that this is a mirror image of the problem of inadequate investment, arising in the observable case. Whereas in that case, the seller was willing to invest too little because he captured only part of the social surplus in bargaining, in this case he is willing to invest too much, because the asymmetrical nature of the acquired information allows him to capture more than the entire surplus. As will be seen next, the result may or may not continue to hold under the reliance measure.

Reliance Damages

Let us therefore turn to examine the parties' respective choices of reliance, trade, and information acquisition when reliance damages are awarded as the remedy for breach.[25]

Seller's Incentive to Perform: As is well acknowledged in existing literature, under conditions of uncertainty the seller carries an inadequate incentive to perform. To see why, observe that the seller gains $p-c$ if he performs and bears liability of x if he breaches. Trade, therefore, occurs if and only if $p-c \geq -x$, or equivalently, when $c \leq p+x$. This implies, in turn, that when $p+x \leq c \leq v(x)$, the seller breaches although performance would have been (ex post) efficient.[26]

This undesirable result is averted if information is acquired prior to the time of contracting. Information allows the parties the flexibility of setting the price as a function of the realized cost. Accordingly, as long as the cost of production is less than the buyer's valuation net of reliance costs, there exists a mutually beneficial contract the parties will enter into. Trade is thus carried out efficiently (from an ex ante perspective), that is, if and only if $c \leq v(x)-x$.

Buyer's Choice of Reliance: The scope of available information also impacts the buyer's reliance choice. If information is acquired and disclosed, the parties proceed to contract only if trade is desirable. As breach therefore does not occur in equilibrium, the buyer's expected payoff is $v(x)-p-x$. Thus, as in the case of expectation damages, x_2 is the chosen level of reliance.

Things get somewhat murkier if information is either not acquired, or acquired but concealed. As the buyer, in those cases, cannot tell whether the seller is informed,

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[25] The analysis pertaining to the case where information is not acquired is again due to Shavell, supra note 4.

[26] For simplicity, I assume in this section that the parties do not renegotiate the contract upon breach. This assumption makes the analysis more straightforward, without affecting the qualitative results.

his choice of reliance must rely on some constructed belief regarding the seller's type. If he attaches a probability of one that the seller is informed, he again chooses the level of x_2, as he then knows that – given contracting – the seller will never breach. If, conversely, he attaches a probability of one that the seller is uninformed, his level of reliance rises. Namely, observe that when contracting with an uninformed seller, the buyer's expected payoff is given by

$$\int_{\underline{c}}^{p+x} \left(v(x)-x-p\right) f(c)dc\,. \tag{9}$$

Accordingly, the first-order-condition requires that:

$$v'(x) = 1 - \frac{\frac{dF\left(p+x\right)}{dx}\left(v(x)-x-p\right)}{F\left(p+x\right)}. \tag{10}$$

where both the numerator and the denominator of the second expression are positive. Denoting this level of reliance as x_3, it therefore follows that

$$x_3 \geq x_2\,. \tag{11}$$

Also notice that the difference between x_3 and x_2 rises with the buyer's gains from trade $\left(v(x)-x-p\right)$, and therefore:

$$\frac{dx_3}{d\theta} \leq 0\,. \tag{12}$$

Intuitively, the reason why the reliance measure generates heavier reliance than the expectation measure is that under the former the buyer strictly prefers performance to breach, whereas in the latter he is indifferent between the two. Under the reliance measure, the buyer therefore uses reliance not only to enhance his gains upon performance, but also to reduce the probability of breach.

This intuition also explains the relation between the value of x_3 and the buyer's bargaining power. Namely, the greater the buyer's gains from performance, the greater his benefits from performance as opposed to breach. It follows that under the reliance measure, the cost he is willing to bear to raise the probability of performance must rise with his bargaining power. Analogously, as his gains from performance approach zero, and thus the gains from performance and breach converge, so do the values of x_3 and x_2.

In the general case, in which the buyer does not know for certain whether the seller is informed or not, he will thus attach a positive probability to both seller types. His level of reliance will therefore be derived as a weighted average between x_2 and x_3, in a manner that corresponds to the probability he assigns to each type of seller. Let us refer to that level as x_4.

Social Value of Information: Recall that the social value of information is the added surplus generated by the availability of information. Hence, it is given by:

(13)

$$\overline{T}^{S}_{rel} = \left[\int_{\underline{c}}^{c^*}\left(v(x_4)-x_4-c\right)f(c)dc + \int_{c^*}^{v(x_2)-x_2}\left(v(x_2)-x_2-c\right)f(c)dc\right] - \left[\int_{\underline{c}}^{p+x_4}\left(v(x_4)-c\right)f(c)dc - x_4\right]$$

where the two terms between the square brackets represent the joint gains from trade with information and without it respectively. In rearranged form,

(14)

$$\overline{T}^{S}_{rel} = \left(1-F\left(p+x_4\right)\right)x_4 + \int_{c^*}^{v(x_2)-x_2}\left(v(x_2)-x_2-c\right)f(c)dc - \int_{c^*}^{p+x_4}\left(v(x_4)-x_4-c\right)f(c)dc\,.$$

Private Value of Information: When information is not acquired, the seller obtains the price of p upon performance, and is liable for x_4 upon breach. His private gains from trade are then given by:

$$\int_{\underline{c}}^{p+x_4} (p-c)f(c)dc - \left(1-F\left(p+x_4\right)\right)x_4 \qquad (15)$$

If, conversely, information is acquired, the seller remains silent if $c \le c^*$ and discloses it otherwise. His private gains thus become:

$$\int_{\underline{c}}^{c^*} (p-c)f(c)dc + \int_{c^*}^{v(x_2)-x_2} \theta\left(v(x_2)-x_2-c\right)f(c)dc - I \qquad (16)$$

The private value of information is therefore given by the difference between the two expressions above:

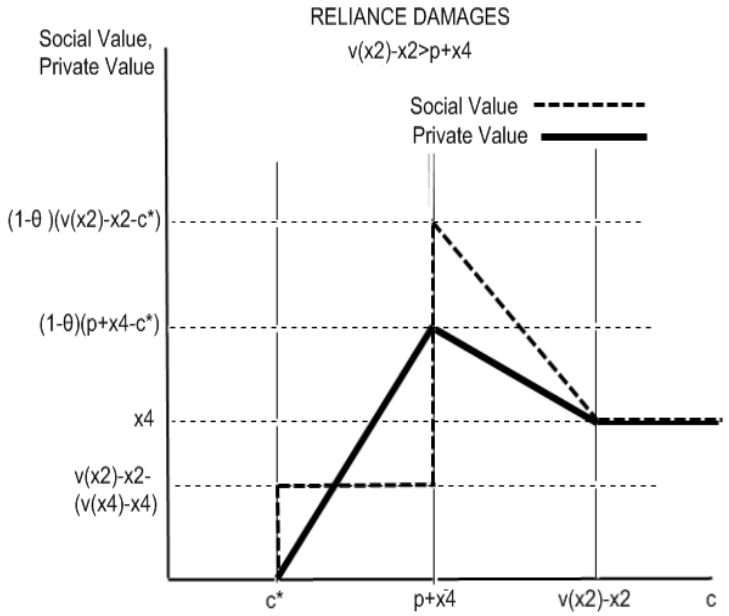
$$\bar{I}_{rel}^{P} = \left[1-F\left(p+x_4\right)\right]x_4 + \int_{c^*}^{v(x_2)-x_2} \theta\left(v(x_2)-x_2-c\right)f(c)dc - \int_{c^*}^{p+x_4} (p-c)f(c)dc \qquad (17)$$

Comparing the Social and Private Value of Information: How do the private and social gains from information compare? As Figure 4 below indicates, in the case of reliance damages, the ultimate outcome remains inconclusive.

In constructing Figure 4 in that way, it is assumed that information increases the incidence of socially desirable trade, so that $v(x_2)-x_2 > p+x_4$. This assumption is made for concreteness, so as to allow a particular graphic representation of the relation between the private and social value of information. The same qualitative conclusions would remain under the converse assumption as well.[27]

[27] See note 28, infra.

Figure 4: Social versus Private Value of Information under the Reliance Measure



As condition (14) indicates, information is socially valuable in that:

(i) It saves a wasteful reliance expenditure of x when trade is not consummated, as $c > v(x_2) - x_2$;

(ii) By preventing inefficient breach when $c \in [p + x_4, v(x_2) - x_2]$, it allows the parties to capture the gains of $v(x_2) - x_2 - c$; and finally,

(iii) It generates more efficient reliance by the buyer in states where information is disclosed, namely when $c \in [c^*, p + x]$.

When $c > v(x_2) - x_2$, there is no misalignment between the private and social gains from information, as the magnitude of liability under the reliance measure exactly equals the social cost arising from the failure to acquire information. In other segments of the cost distribution, however, the private gains depart from the social ones. Namely, when $c \in [p + x_4, v(x_2) - x_2]$, information generates trade whereas

otherwise the seller would inefficiently breach. These gains are shared between the parties, and so the seller privately extracts merely a portion of θ from the added surplus.[28] Finally, when $c \in [c^*, p + x_4]$, two conflicting effects are in play: First, the improvement in reliance raises social welfare, and the seller extracts only part of that value; but second, information allows the seller to raise the price above p, and thereby attain a distributive advantage. [29] The ultimate relation between the social and private gains within the segment therefore remains inconclusive.

It follows from the foregoing that the ultimate relation between the social and private optima depends on the form of $f(c)$. As more probability mass is apportioned to segments in which the private value exceeds the social value, the seller tends to invest excessively. And as less probability mass is allotted to those segments, he tends to invest inadequately. The ultimate outcome is thus highly case-specific.

The division of bargaining power also impacts this result. As can be verified by reference to equations (14) and (17) (17), when the seller holds the entire

[28] Recall that Figure 3 rests on the premise that $p + x_4 < v(x_2) - x_2$. The primary significance of that assumption concerns this segment. Suppose, therefore that $p + x_4 > v(x_2) - x_2$, and hence the corresponding segment is $[v(x_2) - x_2, p + x_4]$. In that case, information is of social value in that it saves the parties from inefficient trade, by the magnitude of $c - (v(x_2) - x_2)$. The private gain, however, of $c - p$, outweighs the social gain, as $p \le v(x_2) - x_2$. It follows that when $p + x_4 > v(x_2) - x_2$, the private incentive will be excessive more often then under the reversed condition. However, for analogous reasons to those discussed in the text, the ultimate incentive may still remain excessive, due to indeterminate effects in the segment $[c^*, v(x_2) - x_2]$.

[29] The private value of information begins at zero for $c = c^*$ and subsequently grows to $[c + \theta(v(x_2) - x_2 - c)] - p$ for higher values of c. Ultimately, for $c = p + x_4$, it reaches $(1-\theta)(p + x_4 - c^*)$. See equation (17). Conversely, the social value of information is a non-negative constant function, whose value equals $v(x_2) - x_2 - (v(x_4) - x_4)$. See equation (14). Note that in the example depicted in the Figure, it is assumed that $(1-\theta)(p + x_4 - c^*) > v(x_2) - x_2 - (v(x_4) - x_4)$, although the converse could also be true in some cases. This, however, does not affect the general point made here, which is that the reliance measure could lead to either an inadequate or an excessive incentive to invest in information.

bargaining power, all deviations from the private optimum disappear.[30] Intuitively, this is simply because such a seller, who invests in enlarging the size of the pie, captures the full return for his investment. Furthermore, as he already charges the buyer the most the buyer would ever pay, information cannot produce an additional distributive advantage. Accordingly, as he extracts less in bargaining, the possible departures from social optimum, either upwards or downwards, become progressively more severe.

We have so far seen that the nature of the socially optimal measure depends in large part on variables that are quite case-specific. Do the parties carry the incentive to choose that measure efficiently? As the next section suggests, the answer will often be "no".

Socially Optimal Measure versus the Measure Chosen in Fact

In the observable case, it was earlier shown that rational parties, while acknowledging the nature of the welfare-maximizing measure, often fail to select it, and instead opt for a dominated one. This result continues to hold in the unobservable case, although the reasoning is quite different. This section explains the nature of this inefficiency and characterizes the conditions under which it comes about.

In the absence of an explicit message from the seller indicating his discovered cost of production, the buyer may interpret his silence in two possible manners. One is that the seller is informed but silent; whereas the second is that, due to prohibitive information costs, he has genuinely decided to remain uninformed, and therefore holds no private information. The parties' choice of a damage measure turns out to depend substantially on the buyer's *belief* regarding the seller's true character. Had he known, as a matter of certainty, that the seller were informed, he would reason that

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[30] To see this, note that $\theta = 1$ implies that $p = v(x_2) - x_2$ and that $x_2 = x_4$ (see equation (10), and recall that x_4 is a weighted average of x_2 and x_3.) Equations (14) and (17) thus reduce to:

$$\bar{I}^{S}_{rel} = \bar{I}^{P}_{rel} = \left(1 - F\left(v(x)\right)\right)x + \int_{v(x)-x}^{v(x)} \left(c - \left(v(x) - x\right)\right) f(c)dc \,.$$

the seller would never enter into a contract he would ultimately breach. Thus, given that a contract is formed, the magnitude of compensation upon breach would be of no consequence. The buyer would therefore best serve his own interests by paying nothing for an entitlement to damages.

As far as the buyer knows, however, the seller might also be truly uninformed. Had he known *that* with certainty, he would reason that breach might well occur, and hence his gains from contracting may very much depend on the nature of the breach remedy. Thus, in particular, he would typically be ready to pay a positive amount for a generous damage measure.

The buyer must therefore shape his strategy with reference to both possibilities. He must assign a probability to each possible type of seller, and accordingly determine his willingness to pay for any increase in breach liability. By the nature of this setting, therefore, there is an inevitable gap between the seller's actual type and the probability the buyer assigns to it. As will next be shown, that gap is the fundamental source of this form of inefficiency.

To see this, consider two measures, d_i and d_j, and let $q(d_i)$ and $q(d_j)$ denote the probability of breach induced by each of them respectively, when information is not acquired. Suppose that $q(d_i)d_i > q(d_j)d_j$ and $w_{NI}(d_i) > w_{NI}(d_j)$, so that d_i generates both a more efficient contract and a higher expected liability for breach. The relation between the expectation and reliance measures is typically of that form, in that expectation generates greater liability, while often it is also more efficient, due to its superior impact on both trade and reliance. Further, let η denote the efficiency advantage from selecting d_i rather than d_j, so that $\eta = w_{NI}(d_i) - w_{NI}(d_j)$; and finally, let π denote the subjective probability assigned by the buyer that the seller is uninformed.

Now suppose that a buyer and an uninformed seller consider whether to adopt measure d_j, or rather opt for d_i. If d_i is selected, the seller receives an efficiency benefit of $\theta\eta$, but bears a higher expected liability for breach. Hence, the lowest payment he would require from the buyer for his willingness to choose d_i is:

$$\left[q(d_i)d_i - q(d_j)d_j\right] - \theta\eta \qquad (18)$$

The buyer, on the other hand, obtains a share of $(1-\theta)\eta$ from the added surplus, as well as a higher expected compensation in the event of breach. Both these benefits, however, are subjectively discounted by π, the probability he assigns to the seller being uninformed. Hence, the most the buyer would pay for d_i is:

$$\pi\left\{\left[q(d_i)d_i - q(d_j)d_j\right] + (1-\theta)\eta\right\} \qquad (19)$$

It follows that a bargain is possible if and only if (19)>(18). It is apparent, however, that this condition may well not hold. In particular, the lower the value of π, the more likely it is that the buyer would refuse to pay the minimum price required to have d_i as the applicable measure. Thus, despite the fact that the parties are free to select any term they wish, and although they are perfectly rational, they may ultimately choose a dominated measure.

V. Remark: The Case in which Information is Unobservable and Non-Certifiable

This paper has explicitly examined two cases, one in which information is observable, and the other in which it is unobservable, but certifiable. But, of course, a third option also exists, in which the seller acquires information, which he cannot credibly convey to the buyer. Thus, for instance, consider again the example of a contractor who examines the soil to determine whether construction is feasible. Further suppose that in doing so, he utilizes nothing but his personal expertise. While he may report his findings to the landowner, such a report will not necessarily be credible. For if the implication of the report is that the construction project requires greater effort on his behalf, and consequently more generous compensation, the landowner might doubt the contractor's candor. How would the analysis be affected by assuming such as state of affairs?

The case of non-certifiable information may be usefully thought of as a simplified version of the unobservable but certifiable case. Namely, one could conceive of it as a setting in which information is obtained privately, but never

disclosed voluntarily. It follows that information affects neither the price the seller can charge nor the choices of the buyer. Its welfare consequences are thus restricted to its effect on the seller. For states of the world in which the contract is performed, it serves to relieve him of risk, and to otherwise improve the efficiency of his actions and decisions. In that case, as these benefits accrue to the seller alone, they are perfectly internalized.

Conversely, for states in which the contract is breached, information allows him to avoid liability. His private benefit thus comports with the social one if and only if the selected measure is that of reliance, which efficiently estimates the harm suffered by the buyer. Accordingly, any measure exceeding reliance generates an undue incentive to invest, whereas the converse is true for any lesser measure.

Finally, in this case as well, the parties may well fail to select the welfare-maximizing measure, for essentially the same reasons as in the unobservable-but-certifiable case.

VI. Concluding Remarks

Lack of information is perhaps the most crucial cause of contractual inefficiencies. And yet, the analysis of contract law has devoted strikingly little attention to examining the effect of legal rules on information. This paper explores this relationship with respect to damage measures for breach of contract. It begins by characterizing the incentives for information-gathering, and their systematic departure from the contours of the social optimum. When information is observable, investment in information is inadequate, regardless of the applicable measure. When it is unobservable, it may either remain inadequate or become excessive. Either way, the failure to place appropriate incentives for information gathering generates a host of derivative problems, which may carry a substantial negative effect on the parties' ultimate welfare.

Be the impact of information on welfare what it may, however, it is not a variable the contracting parties take into account upon designing their agreement. When acquired information is observable, a measure producing superior information will never be selected. And when it is unobservable, it could be selected only by a rare coincidence, never by an informed choice aimed at creating a superior informational

incentive. As the parties are aware, the path that they choose may well not be optimal. However, due to strategic impediments, the alternative, superior path is one they are effectively unable to take.

In the observable case, this unfortunate eventuality can be attributed in part to an overly strict doctrine pertaining to contract modification. If the parties were free to bind themselves to the welfare-maximizing choice, then a hands-tying agreement, preventing them from fulfilling their ex post preferences, could in some cases help to alleviate the problem. This lack of doctrinal flexibility, however, should take only some of the blame. For even if the rule were suitably changed, asymmetric information may substantially impede on the contracting process and prevent it from reaching its desirable conclusion.