Completing Contracts in the Shadow of Costly Verification

Albert H. Choi*        George Triantis†

*University of Virginia School of Law, ahc4p@virginia.edu
†Harvard Law School, gtriantis@law.harvard.edu

This working paper is hosted by The Berkeley Electronic Press (bepress) and may not be commercially reproduced without the permission of the copyright holder.

http://law.bepress.com/uvalwps/olin/art34
Copyright ©2007 by the authors.
Completing Contracts in the Shadow of Costly Verification

Albert H. Choi and George Triantis

Abstract

Contract theory typically holds that verification costs are obstacles to complete contracting; yet, real world contracts often contain provisions that seem costly to verify. We show how a costly signal can play an important role in contracts. Verification (or litigation) costs operate as a screen on the promisee’s incentive to sue and as a sanction against the breaching party. So long as the court’s judgment is correlated with the realized state of the world, therefore, the parties can design a set of prices (including damages) so as to provide additional incentive to the promisor through an off-the-equilibrium, credible litigation threat. We show that contract parties may prefer to adopt a costly signal over a costless signal. Rather than focusing solely on either the problems of adjudication or those of contracting (without sufficient regard to how the disputes will be resolved in the future), we have attempted to take a more comprehensive approach by looking at the design of contracts in anticipation of the path of the adjudication process.
Completing Contracts in the Shadow of Costly Verification

Albert Choi
University of Virginia Law School

and

George Triantis
Harvard Law School

Abstract
Contract theory typically holds that verification costs are obstacles to complete contracting; yet, real world contracts often contain provisions that seem costly to verify. We show how a costly signal can play an important role in contracts. Verification (or litigation) costs operate as a screen on the promisee’s incentive to sue and as a sanction against the breaching party. So long as the court’s judgment is correlated with the realized state of the world, therefore, the parties can design a set of prices (including damages) so as to provide additional incentive to the promisor through an off-the-equilibrium, credible litigation threat. We show that contract parties may prefer to adopt a costly signal over a costless signal. Rather than focusing solely on either the problems of adjudication or those of contracting (without sufficient regard to how the disputes will be resolved in the future), we have attempted to take a more comprehensive approach by looking at the design of contracts in anticipation of the path of the adjudication process.

* For helpful comments, we thank Ronen Avraham, Yeon-Koo Che, Bentley McLeod, Chris Sanchirico, Robert Scott, Abraham Wickelgren, and participants at workshops at the law schools of Columbia, Fordham, Harvard, Northwestern, NYU, Pennsylvania, and Virginia. Please do not cite or quote without the authors’ permission. Last revised on April 6, 2007. Comments are welcome to albert.choi@virginia.edu or gtriantis@law.harvard.edu.
I. Introduction

In contract theory, verification costs are an important barrier to complete contracts. These costs arise because the legal enforcement of contracts requires the court to engage in costly fact finding: such as whether a contingency materialized or whether the defendant performed as promised. Even if parties could anticipate and agree to distinct obligations in different future states of the world, the benefits of doing so may be outweighed by the verification costs of enforcing the contract in court. Contract theory reduces the process of contract enforcement to a simple binary categorization: either contract terms can be enforced at no cost or they cannot be enforced because they rely on non-verifiable factors.\(^1\) A fundamental premise in the scholarship on contract design is that parties condition their obligations only on measures that are verifiable to a court. This premise is common to two lines of contract theory: agency contracts and sales contracts (e.g. Hart/Moore 1988). An agency contract, for instance, might condition payment on verifiable output but not on unverifiable effort. A sales contract might condition the price on whether verifiable trade occurs and not on the non-verifiable actions of the agent that would increase the likelihood of trade.

This approach is at odds with commercial contracting practice, where parties often include requirements or conditions that seem to invite significant litigation costs. These contract provisions fall in two categories. First, the verification of some provisions calls for evidence that is costly to present (such as expert testimony) or that is easy to fabricate (such as a subjective state of mind). Second, the parties may use standards (such as “best efforts”) instead of rules (such as work hours) in their contract. In these cases, the litigation process must inject content into the standards in order to determine the relevance and weight of various evidentiary proxies presented by the parties at litigation (Scott/Triantis 2006).

Both types of terms are common in commercial contracts and threaten to impose large litigation costs on the parties. Franchise agreements, for example, motivate franchisees by leaving them with the surplus of revenues after they pay royalties and other fees to the franchisor. Although a court may verify revenues relatively easily, franchise contracts contain other provisions that are more costly to enforce. For example, the franchisee covenants to maintain the confidentiality of information obtained from the franchisor confidential. The franchise contract of Church’s Chicken provides a typical clause: “Franchisee shall not, during the term of this Agreement or thereafter, communicate, divulge, or use for the benefit of any other person…any confidential information, knowledge, or know-how concerning the construction and methods of operation of the Franchised Business”.\(^2\) The subsequent paragraph excepts “information

\(^1\) This highly stylized approach lies in contrast to the more detailed economic analysis of litigation and its effect on the deterrence yielded by tort law and public regulation (which we summarize in Part II, below).

\(^2\) Sample Church’s Chicken (AFC Enterprises, Inc.) Franchise Agreement at http://library.consumergroup.com/library_sbn/145/145312.asp, section 12.02. For another example in the same industry, see Same Kentucky Fried Chicken contract at http://library.consumergroup.com/library_sbn/146/146134.asp.
which…came to Franchisee’s attention prior to disclosure thereof by Franchisor; or which, at the time of disclosure thereof by Franchisor to Franchisee, had become a part of the public domain, through publication or communication by others; or which, after disclosure to Franchisee by Franchisor, becomes a part of the public domain, through publication or communication by others.” The franchisor has the right to terminate the franchise for breach of this promise. The franchisor has some incentive to terminate opportunistically in order to appropriate the franchisee’s investment in the location. Yet, the breach of the confidentiality promise is difficult to prove (or disprove) because the revelation of confidential information, even if demonstrated, must be attributed to the franchisee rather than other sources.

Franchise contracts also contain standards that raise the prospect of costly litigation. For example, the franchisee covenants that it “shall devote full time energy and best efforts to the management and operation of the Franchised Business” and “shall maintain…the premises…in conformity with Franchisor’s high standards and public image.” In addition, the franchisee promises not “to do or perform…any other act injurious or prejudicial to the goodwill associated with the Franchisor’s [mark]” The breach of these covenants may give the franchisor the right to terminate and, as with the confidentiality promise, they therefore raise the prospect of significant litigation expenditures.

Executive employment contracts exhibit a similar pattern. Executives are motivated by a combination of base salary and incentive compensation, which may be in the form of company stock or options. In addition, compensation tends to be deferred, for example, by the delay in vesting of stock or option rights. Executives make promises similar to franchisees in the form of covenants not to compete, not to solicit employees or customers, and to maintain confidentiality. Breaches of these promises are hard to prove and invite protracted litigation. In addition, like franchisees, executives commit to the standard of best efforts. The breach of these promises triggers the company’s right to terminate and may thereby lead to the loss of future compensation, as well as the loss of company shares or options that have been awarded but not vested.

---

3 Id., 15.02(G).
4 Id., 13.01
5 Id, 10.01.
6 Id, 13.02.
7 If franchisee fails to comply with the last of the three covenants, the franchisor may terminate, without giving franchisee opportunity to cure. (15.02(F)). If franchisee defaults on either of the first two, then the franchisor must provide 30 days to cure to franchisor’s satisfaction (15.03), but if the franchisee commits the same default or commits more than one default in a year, then the franchisor has right to terminate without giving further opportunity to cure. (15.02(K), (L)).
9 Specifically, contracts typically provide that these rights are lost where the company terminates for cause, which includes the material breach of a term such as confidentiality. It also includes “gross negligence or willful misconduct”. The Kmart contract qualifies this further, by adding: “unless the Executive believed
Contract theory does not explain the combination of low- and high-verification cost measures. One reason relates to the multitasking problem raised by a single and noisy output measure, such as revenues or stock prices. Franchisees and executives may focus excessively on tasks that increase the value of these measures and neglect other dimensions of their roles that are important to the maximization of the contract surplus. Thus, for example, the franchise contract disciplines the franchisor, whose acts undermine the value of the franchise mark or disclose confidential information, by threatening termination. Other provisions, however, are not easily explained in this manner because they appear to cover the same behavior as the output measures. We focus on these types of provisions in this paper.

The problem can be framed as follows. Contracts seek to align behavioral incentives by invoking legal enforcement. Yet, despite the conventional premise of contract theory, the desired behavior is very rarely directly and costlessly verifiable and enforceable. Therefore, contracts rely on proxies or signals that are inaccurate and costly to verify, to varying degrees. If several noisy signals were all costless to verify, then the parties should use all of them, particularly when the agent is risk averse or judgment proof. The use of multiple signals helps to dampen the exogenous risk inherent in a single signal and reduce the share of the surplus captured by a judgment proof agent. The role of verification costs is more complicated, and our paper suggests that, in some cases, these costs may further aid in the structure of efficient incentives.

When a contract induces performance, it does so in the shadow of litigation and judicial enforcement. A promisor performs her obligation because she believes that the plaintiff will be less likely to sue her successfully if she performs than if she does not. Indeed, a contract can be designed to reinforce this incentive by ensuring that the promisee is much more likely to sue—or will only sue—if the promisor breaches than otherwise. In game theoretic terms, verification often lies off the equilibrium path, so that verification costs threaten a sanction but are not incurred in fact. Even if the promisor fails to perform, verification costs may be avoided if the parties settle; it is well known that the vast majority of disputes between contract parties are settled before trial.

The fact that verification costs are usually not incurred does not mean that they are irrelevant. They frame the threat that induces settlement or performance. Thus, they are an important tool in contract design. We demonstrate in this paper that verification costs may be harnessed to improve the efficiency of contract design. Thus, contracts may be more complete than is conventionally represented in contracts scholarship. Indeed, contracting parties may sometimes prefer terms with higher rather than lower verification costs. The key to this analysis is to examine more closely the path of contract enforcement, particularly the incentives of parties to sue, to invest in litigation and to settle their disputes. This paper is a first step in this direction.

in good faith that such act or nonact was in, or was not opposed to, the best interests of the Company' para 1(c).
In Part III, we begin with a principal-agent contract, where the value of the agent’s service depends on his effort as well as on random factors. The optimal contract should induce the agent to make the efficient investment of effort, but the agent’s effort is costly to verify. Therefore, the contract must choose among noisy signals. We stipulate that one is costless to verify—the value of the output—and the other is costly—the court’s determination as to the agent’s effort. In our example, the principal designs the contract. She can induce the agent’s investment by conditioning price only on the value of the output, but this contract yields two potential sources of inefficiency. First, it imposes risk on the agent that is costly if the agent is risk averse. Second, if the agent is wealth constrained, this constrain limits the fine that can be imposed on the agent in the event of a bad outcome. As a result, the agent receives a positive expected profit from the contract and shares in the contract surplus. This may have efficiency as well as distributional consequences. In some cases where the incremental surplus from high investment is small, the principal may opt against the incentive contract because she would not be able to capture the surplus from doing so.

We show that adding a costly but informative signal, a court’s finding as to whether the agent breached her promise to invest effort, can make the contract more complete, less risky for the agent and more attractive to the principal. Specifically, the contract damages may be set, in light of expected verification costs, to provide the incentive for the principal to sue if and only if the agent fails to invest. If the damages are sufficiently high, the agent invests and the principal does not sue. Moreover, the litigation costs provide additional sanction against the agent’s breach, without over-stimulating suits by the principal; they create a wedge between the threatened sanction on the agent and the expected net payoff to the principal. We conduct a comparative statics analysis to show how the desirability of the costly signal depends on the ratio of the cost of litigation to the cost of the agent’s effort investment.

In Part III, verification costs lie off-the-equilibrium path because the agent performs in equilibrium and the principal does not sue. In Part IV, we introduce the second way in which verification costs move off-equilibrium: through pre-trial settlements of disputes. As a first crack, we continue to assume that the parties are symmetrically informed, and therefore certain to settle. If the agent has significant bargaining power in settlement negotiations, the prospect of settlement dilutes the sanction imposed by litigation costs. If the contract is designed to try to restore the agent’s investment incentive, it will probably be less efficient, given our assumptions, than if the parties were unable to settle. This result underscores that the combined screening and deterrence function of litigation costs cannot be replicated contractually through prices or damages. Part V concludes with some thoughts for future research. In particular, future research may relax our assumption of symmetric information between the parties.

II. Related Scholarship

This paper is related to several strands of scholarship that relate the litigation process to the objective of optimal deterrence, particularly in the fields of tort law and
public regulation (such as tax or environmental regulation). In this respect, among others, it is striking how contracts scholarship has followed such a strikingly independent path to these fields. One group of scholarship focuses on the problems of judicial error and of litigation costs, and their bearing on deterrence. Deterrence depends on difference between the expected sanction on the defendant if she is guilty as opposed to innocent. Judicial error may be Type I (a guilty defendant is found innocent) or Type II (an innocent defendant is found guilty). Both types of errors attenuate the deterrence from enforcement, at least if we set aside incentive to bring suit (e.g., Polinsky and Shavell 1989).

If enforcement hinges on judicial finding of the materialized value of a continuous (rather than binary) variable, then the risk of error may lead to excessive deterrence (e.g. in the tort of negligence), because the cost of falling even slightly short of the standard may be large (Calfee and Craswell 1984; Craswell and Calfee 1986; Shavell 1987). However, if the court is very poorly informed, then under-deterrence is more likely. Investment in improving accuracy of fact-finding may address this problem, but a better approach might be to adjust the standard of care (Kaplow 1998, at 2). Other work concerns the effect of judicial error on the choice between negligence and strict liability (e.g. Shavell 1987; Calfee and Craswell 1984; Kahan 1989).

In a notable extension into contract design, Gillian Hadfield demonstrates that, where judges make errors, vague standards may be preferable to hard-line rules because they do not attach sharp changes in the probability of liability to small changes in behavior at the turning point for liability. As behavior improves, there is a gradual reduction in the probability of liability and this moderates the over-deterrence effect identified in Craswell and Calfee. (Hadfield 1994)

If enforcement gives rise to costly litigation, these costs may outweigh the deterrence benefit from enforcement. Spending more on accuracy may improve deterrence by deepening the wedge between the expected sanction if the defendant is guilty as opposed to innocent (Kaplow and Shavell 1994). However, both the added accuracy in fact finding and precision in legal rules are not worth their cost if the defendant cannot predict the more precise enforcement at the time of its action (or if it stimulates excessive investment in predicting the likely judicial outcome). (Kaplow and Shavell 1994; Kaplow 1995).

These findings are relevant to contract design. For example, liquidated damages based on average harm are preferable to expectation damages if the promisor lacks information about the vulnerability of the promisee. (Kaplow and Shavell 1996). In addition, incremental expenditures in fact finding may not be worth their cost if the promisor cannot predict the outcome. Also, the analysis of accuracy bars on the optimal complexity of legal rules in public regulation such as tax or environmental law. Kaplow, for example, writes that “Differentiation tends to be more efficient the lower are information costs (both for individuals, ex ante, and for the enforcement authority, ex
Both litigation costs and judicial error determine whether a civil action is brought against the defendant. The prospect of judicial error may skew the selection of cases. Type I error discourages lawsuits, even against guilty defendants; Type II error encourages lawsuits, even against innocent defendants. (Polinsky and Shavell 1989) If litigation costs are too high relative to the expected award in damages, they may deter lawsuits and thereby undermine deterrence. Conversely, if damages are too high relative to litigation cost, they may over-stimulate lawsuits, even if the defendant is innocent (Shavell 1987). Thus, the incentive to bring suit may be manipulated by changing the cost of litigation and the damages awarded if the defendant is found guilty. (Polinsky and Shavell 1989). In this paper, we analyze how damages can be manipulated to set the appropriate incentives both to sue and to perform a contract.

Bernardo, Talley and Welch (2000) and Sanchirico (2001) are similar to our project in that their articles trace the effect of litigation costs on contract performance. Specifically, they analyze how legal presumptions mediate between costly litigation and ex ante incentives. They present a principal-agent model in which the agent is liable for damages if the court finds she has shirked. The probability of such finding is a function of the legal presumption (the weight given to each side’s evidence) and the evidence each side presents to the court. The agent can reduce its marginal cost of evidence by not shirking. The principal decides whether to sue, based on the background rule of legal presumption and the principal’s belief as to whether the agent has shirked. And, the agent’s incentive to shirk depends on whether she believes that the principal will sue. The authors derive equilibrium conditions given different legal presumptions.

Our illumination of costs that rest off the equilibrium path also bears some resemblance to the analysis of renegotiation in Schwartz and Watson (2004). They emphasize the potential trade-off between the cost of renegotiation and the cost of contracting. They suggest, for example, that complex contracts, reached after costly negotiations, might not be efficient when renegotiation costs are low, because the prospect of hold-up behavior in renegotiation undermines the incentives established in the initial contract.

The discussion in this paper also draws on the analysis of settlement of disputes. In particular, the prospect of settlement affects the deterrence from prospective enforcement. Parties are likely to settle when their information is symmetric. The terms of their settlement, however, varies with their relative bargaining power because it determines how the parties will divide the surplus from avoiding litigation costs. If the defendant enjoys greater bargaining power, settlement reduces the sanction below the level it would be if the parties litigated. Conversely, if the plaintiff enjoys bargaining

---

10 Kaplow himself notes the application to contract law, but focuses on the complexity of default rules provided by law, rather than contract design. (Kaplow 1995, at 158)
power, settlement increases the sanction on the defendant. (Polinsky and Rubinfeld 1988).  

## III. The Screening and Deterrence Functions of Verification Costs

Suppose a principal enters into a contract with her agent, such as an employee or a franchisee. The value of the agent’s service to the principal is probabilistic—either $200 ($V_H$) or $120 ($V_L$)—and depends on the agent’s effort (which may be thought of as satisfying “best efforts”). The opportunity cost of the agent’s effort ($C$) is $30 and, if he invests that effort, the probability of the $200 value is 75% ($P_H$) and the probability of the $120 value is 25%. If the agent does not invest that effort, the probability of obtaining the $200 value is 25% ($P_H$) and the probability of obtaining the $120 value is 75%. Under the given parameters, the joint surplus, net of the effort cost, is $150 if the agent makes the effort and $140 if he does not. The agent’s effort is efficient in that it contributes $10 to the joint surplus. The following table summarizes the environment.

<table>
<thead>
<tr>
<th>Effort</th>
<th>Cost</th>
<th>$120</th>
<th>$200</th>
<th>Net Surplus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effort</td>
<td>$30</td>
<td>25%</td>
<td>75%</td>
<td>$150</td>
</tr>
<tr>
<td>No Effort</td>
<td>$0</td>
<td>75%</td>
<td>25%</td>
<td>$140</td>
</tr>
</tbody>
</table>

Table 1: Contracting Environment with Verifiable Value

This Part focuses mostly on comparing two types of contracts. The first conditions price only on the value of the agent’s output that is costless to verify (the $O$-contract). The second contract also conditions price on output value, but it requires the agent to invest effort and imposes a liability to pay damages, $D$, if he fails to do so (the $OI$-contract). The contract is later enforced by a fallible court, so it is more accurate to say that the contract is conditioned upon the court’s finding of fact as to effort. The agent’s effort is costly to verify and the court may err in its finding. Our focus is whether the parties would want to use the second contract, despite the potential court errors and the cost of litigation. We demonstrate that neither judicial error nor the deadweight cost of litigation is a direct obstacle to conditioning price on the agent’s effort. Rather, the desirability of this contract hinges on a more complex relationship between litigation incentives and deterrence.

We make the following additional five assumptions.

---

11 We assume symmetric information. Kathy Spier has demonstrated some interesting effects from settlement under asymmetric information, that will be useful in future work on the effect of settlement on contract design. (Spier 1994).

12 This formulation assumes that the agent’s reliance investment has a direct externality on the principal’s value, i.e., agent’s investment has a cooperative component. When this is true, popular mechanisms, such as options contract, cannot ensure both efficient investment and efficient exchange. See Che and Hausch (1999).

13 If the agent invests, the joint surplus, net of investment cost, is $(3/4)(200) + (1/4)(120) - 30 = 150$. If he does not, the joint surplus is $(1/4)(200) + (3/4)(120) = 140$. 

http://law.bepress.com/uvalwps/olin/art34
Assumption 1: The agent’s best alternative to contracting yields profit of zero from his outside option; this is his reservation price.

Assumption 2: The agent is risk neutral.

Although the agent may bear less risk under the OI-contract than the O-contract, we assume risk neutrality here in order to focus on the advantages from addressing the wealth constraint of the agent. Periodically, however, we note the benefits that would be produced by the OI-contract if the agent were more risk averse than the principal.

Assumption 3: The principal designs the contract and makes a take-it-or-leave-it offer to the agent.

Our demonstration of benefits from using litigation over effort can be generalized to cases in which the principal shares bargaining power with the agent. ¹⁴

Assumption 4: The agent has no assets, so that the contract price may not be negative in any state of the world. Therefore, any damages must be paid as an offset against the entitlement to the contract price.

We make this extreme assumption of wealth constrain in order to facilitate our numerical exposition. Nevertheless, the general results apply as long as the wealth constraints bind and limit the principal’s ability to fine the agent in the event of the low-value output.

Assumption 5: The court will enforce the contract as designed by the principal.

In particular, we assume that the court will enforce the liquidated damages in the contract, if the court finds that the agent has breached the effort clause. ¹⁵

A. Contracting Only on Verifiable Output: the O-contract

If the principal designs the contract without providing incentive for effort, the principal can capture the full contract surplus of $140 by setting a fixed contract price

¹⁴ The problem of providing efficient incentive to the agent might disappear if the agent were the party designing and making the take-it-or-leave-it offer, but the problem may reappear if the principal can make an efficient investment specific to the contract. When inducing effort from the agent becomes more expensive due to either the agent’s risk-aversion or the agent’s capturing of rent, the principal no longer becomes the residual claimant and her incentive to make investment for the project diminishes.

¹⁵ In particular, we set aside the possibility that the liquidated damages might be struck down as a penalty. In our example, the damages may be more palatable if they are offset against the price (which must be greater than the damages because of assumption 4). In this sense, the effort clause may be viewed as making the agreement similar to a cost-plus contract. Moreover, the notion that the agent might be sanctioned even in the event of a high-value outcome is not out of line with real world contracts. Underperforming employees and franchisees in the contracts described in the Introduction can be terminated even if in the event of good outcomes and, in those cases, they might forfeit to their employers or franchisors their human capital investment.
equal to the agent’s reservation price of $0 regardless of the value of the output. If the principal wants to induce the agent to invest, on the other hand, she will have to pay a higher price for the high value, under an O-contract. Her best strategy in this case is to set the contract price at $60 ($W_H$) if the value is $200 and $0 ($W_L$) if it is $120. Under this contract, the agent would choose to invest because he realizes a (weakly) higher expected profit than without.\textsuperscript{16}

Although the O-contract yields a larger joint surplus than the fixed price contract, it has offsetting disadvantages. First, it imposes risk on the agent and the principal will have to bear some of the agent’s risk bearing cost. If the agent’s risk aversion is sufficiently great, the principal will prefer the fixed price contract. In this paper, we focus on a second disadvantage. The O-contract compels the principal to share the contract surplus with the agent, rather than driving the agent down to his reservation value. The principal bears two distinct costs when she chooses to induce effort by opting for an O-contract rather than a fixed-price contract: she must, in expectation, reimburse the agent’s effort cost and she will allow the agent to capture some of the surplus from the exchange. Although only the former cost directly impacts social welfare, the latter may dissuade the principal from choosing the incentive O-contract, even when investment in effort is socially efficient. Surplus sharing has efficiency consequences because the principal’s private cost diverges from the social cost. In the current example, the principal’s expected profit under the fixed price contract exceeds its profit under the O-contract ($140 > 135$).\textsuperscript{17} Hence, even though the agent’s investment maximizes the joint surplus, the principal decides not to induce the agent to make the investment.

B. Contracting on Both Quality and Investment: the OI-contract

Now suppose the incentive contract is conditioned not only on the value of the output, but also on a second measure, the agent’s investment choice (the \textit{OI-contract}). The contract might obligate the agent to make the $30 investment and back this obligation with a sanction of damages, which the parties liquidate at an amount $D$.\textsuperscript{18} For instance,

\begin{itemize}
  \item[\textsuperscript{16}] More formally, if the principal wants to induce the agent to make the reliance investment, she would choose a set of prices to maximize her expected profit, $\mathbb{E}[P_i (V_H - W_H) + (1 - P_i) (V_L - W_L)]$, subject to three constraints: (1) the agent must, in expectation, make at least as high a profit by investing than by not: $(P_i W_H + (1 - P_i) W_L - C \geq P_i W_H + (1 - P_i) W_L)$; (2) the agent’s profit, in expectation, must be as high as his outside option: $(P_i W_H + (1 - P_i) W_L - C \geq 0)$; and (3) prices cannot be lower than zero: $W \geq 0$. $P_i$ denotes the value outcome probabilities conditional on effort $e \in \{e_i, e_o\}$; and $W_j$ denotes prices (wages) conditional on the output value $j$. At optimum, the principal will set $(W_H, W_L) = (\mathbb{E}[P_i (V_H - W_H)], 0) = ($60, $0)$ and the agent, in expectation, will earn $(3/4)($60$) + (1/4)($0$) = $15$.
  \item[\textsuperscript{17}] Under the O-contract, the principal’s profit is $(3/4)($200$ - $60$) + (1/4)($120$) = $135$, which is simply the total contractual surplus, $150$, minus the rent captured by the agent, $15$.
  \item[\textsuperscript{18}] In theory, the parties may be able to make the liquidated damages to depend also on the realized output value: $(D_{W_H}, D_{W_L})$. As we will see shortly, however, because $W_L$ will usually be zero, being able to set positive liquidated damages in that state does not necessarily expand the principal’s contracting choices.
\end{itemize}
the contract might provide: (1) the principal must pay the agent certain price that is conditioned on the realized value of the output; and (2) in case the court declares that the agent has breached his obligation to invest, the agent must pay the principal liquidated damages of $D$ (or, the principal can offset this amount against the price).\footnote{This formulation implicitly assumes that it will be the principal who has to sue the agent to collect liquidated damages. An alternate formulation might obligate the principal to pay a certain price, which depends on the realized output value, but only if the agent has not breached. Under that formulation, (wrongfully) alleging agent’s breach, the principal may withhold payment, and the agent must sue the principal to receive the promised payment. That is more likely to give the option to file suit to the agent. Under that assumption, the agent’s litigation cost will play an important role in constraining frivolous litigation while the principal’s litigation cost plays the role of imposing additional sanction against the breaching principal. The substantive results, however, will be the same.} Given our assumption that the agent is wealth-constrained, we assume that the sum of liquidated damages and litigation cost cannot be larger than the contract price that is promised to the agent ($D + L \leq W$).

We assume that the principal decides to file suit against the agent after (1) the agent has made his effort decision, (2) the value of the output is realized, and (3) the principal has paid the agent in accordance with the contract. The evidence before the court is noisy in the sense of leading the court to make errors of both types (I and II), but we assume the court’s fact finding is correlated with the truth in the following manner. If the agent has invested effort, the principal will win and be awarded damages with probability $1/3$ ($Q_I$); if the agent breached, the probability increases to $2/3$ ($Q_0$). The parties anticipate the judicial outcomes probabilistically and symmetrically. Table 2 summarizes how the litigation outcome and the value of the output are related to the agent’s investment choice.

<table>
<thead>
<tr>
<th>Output Value</th>
<th>Court Fact Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>$120 (L)$</td>
<td>$200 (H)$</td>
</tr>
<tr>
<td>$120 (L)$</td>
<td>“No Breach” ($I$)</td>
</tr>
<tr>
<td>$200 (H)$</td>
<td>“Breach” ($0$)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effort</th>
<th>25%</th>
<th>75%</th>
<th>66.7%</th>
<th>33.3%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Effort</td>
<td>75%</td>
<td>25%</td>
<td>33.3%</td>
<td>66.7%</td>
</tr>
</tbody>
</table>

Table 2: Two Informative Signals

In effect, the OI-contract conditions price on four possible states of the world: high-value output and the court finding that the agent did invest ($W_{HI}$); high-value output and the court finding that agent did not invest ($W_{HO}$); low-value output and the court finding that the agent did invest ($W_{LI}$); and low-value output and the court finding that the agent did not invest ($W_{LO}$). For convenience, we can express the price and liquidated damages structure of a given contract by a vector, $(W_{HI}, W_{HO}, W_{LI}, W_{LO})$.

1. When Litigation is Costless

The court’s judgment works as a second informative signal that the principal can rely on to provide investment incentive.\footnote{For the court’s judgment to provide additional information about the agent’s investment, the output value cannot be a sufficient statistic of the judgment. When the two signals are independent but correlated with}
adding this second signal to the contract clearly improves the contract. The optimal contract, using both signals, would set $W_{HI} =$ $72$ and $0$ in all other states: $(W_{HI}, W_{H0}, W_{Lj}, W_{L0}) = (72, 0, 0, 0)$. In other words, the principal promises to pay the agent $72$ when the good value turns out to be $200$ but this will be offset by the liquidated damages of $72$ when the court finds that the agent did not invest. After observing the high value, the principal always sues the agent to receive the court’s informative judgment. In equilibrium, if the agent invests, he receives a price of $72$ with probability $1/2 = (3/4)(2/3)$. The agent’s expected return, therefore, is equal to $(1/2)($72$) − $30$ = $6$.

Compared to the case where the principal had only one signal to rely on, the agent’s expected profit has gone down from $15$ to $6$, and the principal’s profit has risen to $144$ from $135$. Thus, the court’s informative judgment allows the principal to increase contract completeness and provide a more tailored incentive scheme. In the current example, it allows the principal to reduce the rent captured by the agent and induce the agent to exert costly effort, which is efficient. If the agent were risk-averse, conditioning payment on four different states of the world will enable the principal to reduce the amount of risk imposed on the agent and thereby improve efficiency. Similar to the current example, however, because neither signal is fully informative, the agent will have to bear some risk in equilibrium.

2. Costly Litigation

If litigation is costly, the parties will proceed to litigation only if their (ex post) expected return from the litigation is positive. In particular, the principal will sue the agent for (alleged) breach only if she expects a positive net payoff, given the cost of litigation, the size of the liquidated damages, and probability of obtaining an advantageous verdict from the court. Our analysis of the optimal contract with verification costs has three stages, or goals. First, we define a range of liquidated damages that optimize the principal’s incentive to sue (only when the agent breaches his promise to invest effort), given court error and litigation costs. This translates into a

the investment, this is always true. In this example, the court judgment is “less informative” than the value of the output, since the change in probability is smaller.

21 Similar to the problem the principal faced in designing the optimal O-contract, the principal chooses the set of prices, $(W_{HI}, W_{H0}, W_{Lj}, W_{L0})$ to maximize her expected profit, $P_j(V_n - (1 - Q_j)W_{n0} - Q_jW_{n0}) + (1 - P_j)(V_L - (1 - Q_j)W_{Lj} - Q_jW_{L0})$, subject to three constraints: (1) the agent’s profit from investment, $P_j((1 - Q_j)W_{n0} + Q_jW_{n0}) + (1 - P_j)((1 - Q_j)W_{Lj} + Q_jW_{L0}) - C$, must be at least as large as his profit from no investment, $P_j((1 - Q_j)W_{n0} + Q_jW_{n0}) + (1 - P_j)((1 - Q_j)W_{Lj} + Q_jW_{L0}) ; (2)$ the agent’s profit must be at least as large as his outside option, $P_j((1 - Q_j)W_{n0} + Q_jW_{n0}) + (1 - P_j)((1 - Q_j)W_{Lj} + Q_jW_{L0}) - C \geq 0$; and (3) all the prices must be positive: $W_{ij} \geq 0$. In this general setting, $Q_j$ denotes the court’s judgment of “breach” conditional on the agent’s choice of effort $e \in \{e_1, e_2\}$; and $W_{ij}$ denotes payment to the agent conditional on the realized output value $i$ and the court’s judgment $j$.  

http://law.bepress.com/uvalwps/olin/art34
range of breach sanctions that the principal can impose on the agent, while maintaining the optimal litigation incentive on the principal. Second, given that range, we can identify a subset of liquidated damages and output prices, \((W_H, D)\), that induce efficient effort, while preserving the optimal litigation incentive. This takes litigation off the equilibrium path. Third, we pick the combination that, while satisfying the agent’s reservation value, minimizes the amount of surplus captured by the agent, \(W_H\).

Under an OI-contract with appropriate liquidated damages, the principal can offer a lower price for the high-value output than under the O-contract. The reduction in the discrepancy between the high-value and low-value price reduces the risk borne by the agent, and compensated for by the principal in the contract price. In our model, the OI-contract enables the principal to reduce the expected rent enjoyed by the agent, while maintaining the desirable investment incentive. Thus, the OI-contract not only induces the agent’s efficient investment, like the O-contract, but it also ensures that the principal will prefer an incentive contract to a fixed-price deal. Recall our earlier demonstration that the principal might prefer a fixed price contract to the one that induces investment by paying more for a high-quality good.

Suppose that each party must bear a fixed litigation cost equal to $16 \((L)\) if the principal sues for damages.\(^{22}\) To be consistent with the assumption that the agent has no personal wealth, we assume that the agent’s total loss, including the litigation cost, can never be larger than the contract price \((D + L \leq W)\).\(^{23}\) If the agent has not breached, the principal’s expected return from litigation is \((1/3)D - \$16\), and the agent’s expected loss is \((1/3)D + \$16\). Conversely, if the agent has breached, the principal expects to earn \((2/3)D - \$16\) and the agent’s expects to lose \((2/3)D + \$16\). After observing the agent’s breach, the principal has the incentive to sue if \((2/3)D - \$16 \geq 0\), or \(D \geq 24\). If the agent performs, the principal will abstain from suing if \((1/3)D - \$16 \leq 0\), or \(D \leq 48\).

---

\(^{22}\) While we say that the litigation expenses are “fixed,” we treat the costs and the probabilities as resulting from a litigation game played by both parties. For instance, if \((x, y)\) denote respective amounts of evidence presented by the parties, the principal would choose \(x\) maximize \(p(x, y)D - c(x) - F\) and the agent would choose \(y\) minimize \(p(x, y)D + c(y) + F\) where \(F\) and \(c\) denote fixed and variable costs, respectively. The $20 litigation cost will include both the variable and fixed costs.

\(^{23}\) A more realistic model would incorporate the agent’s optimal litigation behavior. Particularly, the agent might choose not to defend against the suit and simply pay liquidated damages if the expected loss from the litigation exceeded the liquidated damages: \((2/3)D + \$16 > D\). Setting aside the issue of settlement for the moment, although we were not very explicit about what constitutes the litigation cost, we would expect it to come from two sources: fixed and variable. Fixed cost is the one the agent will have to incur whenever he proceeds to litigation, while variable cost would be under his control. If some parts of $16 is fixed, rather than variable, even if the agent decides not to defend the suit in litigation, it is likely that his total litigation loss will be larger than the liquidated damages. If the parties can settle before the suit is filed, of course, the agent may not even need to incur the fixed cost. Hence, the contract might need to work with the constraint that the agent’s litigation loss may never be larger than the liquidated damages: \(\min\{D, (2/3)D + \$16\}\). Whether or not we impose this restriction, however, the substantive results will stay the same.
Thus, if $D$ is set between $24$ and $48$, the principal will sue the agent if and only if the agent breaches.

<table>
<thead>
<tr>
<th>Effort</th>
<th>Principal’s Expected Gain</th>
<th>Agent’s Expected Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effort (1/3)</td>
<td>$(1/3)D - L$</td>
<td>$(1/3)D + L$</td>
</tr>
<tr>
<td>No Effort</td>
<td>$(2/3)D - L$</td>
<td>$(2/3)D + L$</td>
</tr>
</tbody>
</table>

Table 3: Returns from Litigation

Suppose that the contract sets liquidated damages within this range, at $27$. Given the deterrence produced by this level of liquidated damages, the principal may reduce the price for a high quality good to $43$, significantly lower than the price of $60$ under the O-contract.\(^{24}\) Let’s look first at the principal’s litigation incentive under this contract. The principal will sue only if the agent breached and can expect to earn \((2/3)(27) - 16 - 2\) from the litigation. Second, we turn to the agent’s effort incentive. If the agent invests effort, he is not sued and realizes an expected payoff of \((3/4)(43) + (1/4)(0) - 30 = 2.25\). If he fails to invest, not only will his chances of creating the high value output be lower and he would also face a lawsuit from the principal and expect to lose, in litigation, the amount, \((2/3)(27) + 16 = 34\).\(^{25}\) Thus, the non-investing agent expects a return of \((1/4)(43 - 34) + (3/4)(0) = 2.25\). In equilibrium, therefore, the monetary incentive and the litigation threat is just enough to induce the agent to invest. At the same time, the agent captures only $2.25 of surplus because the high-value price has substantially been reduced and much incentive is provided through the credible litigation threat. Note also that the high value price of $43

\(^{24}\) The formal maximization problem is similar to the one with costless litigation but with a few changes, the most important one being giving the principal the right litigation incentive. When the principal wants to induce the agent to make the reliance investment without having to incur litigation costs in equilibrium, she would choose \((W_H, W_L, D)\) to maximize \(P_i(V_H - W_H) + (1 - P_i)(V_L - W_L)\) subject to (1) the agent’s expected profit with investment is as large as his expected profit without investment, \(P_iW_H - Q_oD - L + (1 - P_i)W_L - C \geq 0\); (2) the agent does at least as well as his outside option, \(P_iW_H - Q_oD - L + (1 - P_i)W_L - C \geq 0\); (3) the principal sues the agent only when the agent does not invest \(Q_oD - L \geq 0\); and (4) prices cannot be negative and the high-value price must be larger than the liquidated damages and the litigation cost: \(W_H \geq D + L\). Assuming that \(Q_oD - L \geq 0\) is satisfied, the optimal solution to this problem is given by \(W_L = 0\); \(W_H^* = (C - P_i(1 - Q_o)L)/(P_i - (1 - Q_o)P_o)\); and \(D = W_H - L\). When \(D = W_H - L\), the third constraint becomes \((1 + Q_o)/Q_o)L \geq W_H \geq ((1 + Q_o)/Q_o)L\). Note that so long as the constraint \((1 + Q_o)/Q_o)L \geq W_H \geq ((1 + Q_o)/Q_o)L\) is satisfied in equilibrium, \(W_H^* < C/(P_i - P_o)\): principal should strictly prefer the OI-contract over O-contract. With the parameters given in this example, we get \(W_H^* = 43\) and \(D = 27\).

\(^{25}\) The agent might therefore decide not to defend the suit and simply pay $27 but, consistent with other literature cited in Part II, we make the simplifying assumption that the agent must participate in the litigation.
is enough to cover the liquidated damages of $27 and the litigation cost of $16 for the agent, so that, the agent’s wealth constraint is honored in all states of the world.

The advantage of this OI-contract over the O-contract described earlier is that it can provide for different payoffs between the high- and low-value states, while keeping litigation off the equilibrium path. It minimizes the agent’s share of the rent and, because the pay-for-performance schedule can be less steep ($W_H - W_L$ is smaller), it also reduces the risk borne by a risk-averse agent. The contracts are summarized in Table 4.

<table>
<thead>
<tr>
<th>Contracting Variables</th>
<th>O-contract</th>
<th>OI-contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>$W_H$</td>
<td>$60$</td>
<td>$72$</td>
</tr>
<tr>
<td>$W_{H0} = W_H - D$</td>
<td>$60$</td>
<td>$0$</td>
</tr>
<tr>
<td>$W_{L0} = W_L$</td>
<td>$0$</td>
<td>$0$</td>
</tr>
<tr>
<td>Agent’s Profit</td>
<td>$15$</td>
<td>$6$</td>
</tr>
<tr>
<td>Principal’s Profit</td>
<td>$135$</td>
<td>$144$</td>
</tr>
</tbody>
</table>

Table 4: Comparison of Different Contracts

The example also demonstrates that the principal would prefer contracting in the shadow of a costly litigation and the threat of a significant deadweight loss. The cost of litigation has two distinct and important effects. First, in the absence of litigation cost, the principal would always sue the agent and this indiscriminate lawsuit undermines the provision of efficient effort incentives. These incentives depend on the differential reward (or punishment) to the agent when he breaches and when he performs. When litigation is costless, the agent’s effort reduces the probability of liability from 2/3 to 1/3. When litigation is costly and liquidated damages are set appropriately, the principal only sues the agent when he breaches in fact. Therefore, the agent’s effort reduces the probability of liability from 2/3 to 0. Setting damages equal to $27, for instance, will translate to only $9 of incentive in the former case ($(2/3 - 1/3)(27) = 9$), but $18 of incentive in the latter ($(2/3 - 0)(27) = 18$). Providing incentive to the principal not to sue when the agent does not breach, therefore, makes liquidated damages a more efficient incentive provider.

The second benefit from positive litigation costs is that they supplement liquidated damages as a sanction for breach when the principal sues, and thereby enhance the agent’s incentive to invest effort. Without the litigation cost, the breaching agent still has a 1/3 chance of avoiding liability by virtue of judicial fact finding error. When litigation is costly, however, the principal’s lawsuit against the breaching agent imposes the cost of litigation independent of the outcome: $16 of litigation cost born for sure by the agent is equivalent to $24 of damages when the agent has 1/3 chances of winning
(2/3)($24) = $16). Hence, the litigation cost born by the agent is a more effective deterrence against breach than a probabilistic sanction imposed by a fallible court.26

C. Comparative Statics and the Optimal Litigation Cost

The optimal use of the two signals (quality and the court’s finding of investment) discussed above is sensitive to various parameters, including the agent’s investment cost, litigation costs and judicial error. Suppose we hold constant the risk of judicial error, particularly the probabilities of judgment conditional on investment and non-investment. In this section, we let litigation cost, \( L \), vary relative to the agent’s investment cost, \( C \). To induce the principal to sue only when the agent breaches, liquidated damages, \( D \), must fall within the bounds \([3/2)D, 3L] = [D, \bar{D}]\). Within this range, the sanction on the non-investing agent is \((2/3)D + L\). Thus, the range of litigation sanctions that the contract can impose on the agent for breach while maintaining the principal’s optimal litigation incentive is \([2L, 3L] = [L, S]\). Finally, because the agent has no assets, for the investment clause to be useful, the (high-value) contract price must at least as large as the damages plus the litigation cost: \( W_H \geq D + L \).

As we have demonstrated, the choice of damages sets both incentives for litigation by the principal and for effort by the agent. Difficulties arise when \( L \) is either too small or too large relative to \( C \). We noted earlier that costless litigation would give the principal excessive incentive to sue. Where litigation costs are positive but small compared to \( C \), the range of liquidated damages that yields optimal litigation incentives is constrained, as is the direct sanction of litigation costs. This compels the principal to rely more heavily on the price for high-quality goods to motivate effort. Conversely, if \( L \) is too high compared to \( C \), liquidated damages must be large enough to give the principal incentive to sue. Given that the agent has no assets, the price must be at least as large as the damages plus the litigation cost. Therefore, the principal must offer a higher price for the high-value output, and this leaves the agent with a correspondingly larger share of the surplus in equilibrium (recall that the agent invests in effort in equilibrium so that he is not liable for liquidated damages).

To see the impact of the latter, suppose the effort cost is $10, instead of $30, and the litigation cost remains at $16. Liquidated damages under the OI-contract would have to be at least $24 for the principal to sue the agent in case of breach: \([D, \bar{D}] = [24, 48]\). Given that the agent is wealth-constrained, in order to provide a credible litigation threat for breach of the investment clause, the principal will have to raise the high-output price to $40 (= $24 + $16). Since litigation does not occur in equilibrium, paying the agent $40 when the value of the widget is $200 implies that the agent will receive a rent under the

26 The result is similar in spirit to the main idea proposed in the “decoupling” literature: when litigation imposes a deadweight loss on the society, reducing the plaintiff’s recovery while increasing the defendant’s damages will decrease the number of suits but maintain the same level of deterrence against the defendant. In our example, we are not necessarily decoupling, in the sense of setting two different liquidated damages, but the selection is done through the change of probability of winning by the principal.
OI-contract of \((3/4)(40) - 10 = 20\). If the principal were to rely only on verifiable widget quality, she could have paid the agent only $20 when the quality is high and $0 when low. This well-crafted O-contract induces the agent to invest while lowering the agent’s rent to \((3/4)(20) - 10 = 5\). Thus, a higher litigation to effort cost ratio may lead to the parties selecting an O-contract over an OI-contract. Thus, higher verification costs may induce the principal to condition the contract on the costless signal of quality alone.

What matters in this respect is not the absolute cost of litigation, but rather its ratio to the investment cost.\(^{27}\) In general, as the investment cost rises, so will the optimal litigation cost. This result is not surprising. The higher investment cost implies that the principal will have to compensate the agent more in expectation. Because the agent captures a bigger rent as the investment cost rises, the principal must impose a harsher sanction against the agent. Higher litigation cost allows the principal to do just that. Conversely, when the investment cost is small, so will the prices promised to the agent, and for litigation to provide additional incentive, its cost should be small to be effective.

Let us come back to the initial example with the investment cost of $30. If the principal were free to set the litigation costs, how high or low will \(L\) be? Conditional on the high output price and the litigation cost, it is in the principal’s interest to set the liquidated damages so that \(D = W_H - L\). For the principal to sue the agent only when the agent breaches the contract, we need \((2/3)(W_H - L) - 10 \geq (1/3)(W_H - L) - 1\) or \(4L \geq W_H \geq (5/2)L\).\(^{28}\) So, the principal’s objective is to maximize her expected return while (1) giving enough incentive to the agent to exert costly effort; and (2) keeping the high output wage within this bound. Holding everything else constant, decreasing \(W_H\) will increase the principal’s expected return. Also, so long as the principal sues the agent only after breach, increasing the litigation cost will better discipline the agent’s behavior. Hence, at optimum, we should have \(W_H = (5/2)L\).\(^{29}\) In our example, this is done by setting \(L = 120/7 \approx 17.14\); \(W_H = 300/7 \approx 42.86\); and \(D = 180/7 \approx 25.71\). The principal, in expectation, earns about $147.9 and the agent’s rent is reduced to approximately $2.14. If the investment cost were $20, the optimal litigation cost is $11.43; and if the investment cost were $40, the optimal litigation cost is $22.86. In short, as the investment cost rises, the principal would prefer a higher litigation cost.

IV. Verification Costs and Settlement

\(^{27}\) We note that this is different from the conventional concern with verifiability in contract theory. Our results focus on the ratio of litigation costs to the cost of the agent’s specific investment that the contract seeks to induce.

\(^{28}\) This is equivalent to \(((1 + Q_r) / Q_r)\)\(L \geq W_H \geq ((1 + Q_r) / Q_r)L\).

\(^{29}\) The optimum litigation cost can be derived by setting \(W_H = (C - P_L(1 - Q_r)L) / (P_L - (1 - Q_r)\)P_r\) = \(((1 + Q_r) / Q_r)\)L and solving for \(L\). This produces \(L = Q_rC / ((1 + Q_r)P_L - (1 - Q_r)\)P_r\) + \(P_rQ_r(1 - Q_r)\). This expression makes clear that as the investment cost rises, so does the optimum litigation cost.
In Part III, the parties avoided litigation costs by providing the plaintiff with the incentive not to sue in equilibrium, through the appropriate adjustment of liquidated damages. In this analysis, liquidated damages were serving a dual purpose, along with litigation costs: providing the efficient incentives for both the plaintiff’s decision to sue and the agent’s decision to invest effort. One might wonder, therefore, whether it would be better to focus liquidated damages on the agent’s incentive and use another technique to move litigation off the equilibrium: namely, the possibility of settlement. Under this strategy, the optimal contract is different because settlement alters the effective sanction on the agent. We suggest below that OI-contracts may be less efficient if the parties can settle than if the parties manipulate the principal’s incentive to sue through liquidated damages (as in part III).

The prospect of settlement is trivial when the contract conditions only on verifiable output value or when litigation is costless, because there is nothing to be gained by avoiding litigation. Settlement is significant only when there is positive surplus from the saving of litigation costs. While there are many ways of modeling settlement, we take a parsimonious approach. We assume that nature selects either the principal or agent to make a one-time take-it-or-leave-it settlement offer, after the output value has been realized but before the suit is filed by the principal. That offer is then either accepted or rejected by the offeree. If he accepts, the game ends; but if he rejects, the principal decides whether to file suit against the agent or not. The parties will settle at a positive amount only when the principal has a credible threat. The settlement amount will be determined by the respective bargaining powers and the reservation values.

Consider the OI-contract discussed in the previous section: 
\( (W_{H}, W_{H0}, W_{L}, W_{L0}) = (43,16,0,0) \). Given the liquidated damages of $27, the principal has a credible litigation threat only when the agent breaches the effort clause. In that case, the principal’s expected return from litigation is $2 while the agent’s expected loss from litigation is $34. Their reservation values are $2 and $34, respectively. The difference is the litigation cost saving that will be divided between the two parties in the settlement bargain, according to their relative bargaining power.

Unless the principal enjoys all the bargaining power, the agent will face a lower aggregate sanction by settlement than if the contract were enforced by litigation (the settlement amount will be less than $34). If the agent has all the bargaining power, he can avoid his own litigation costs and also extract the principal’s litigation cost savings from avoiding trial. This will substantially reduce the sanction for breach from $34 to $2.

30 This formulation is similar to that used in Nalebuff (1987). The difference is that we do not deal with the information asymmetry problem.

31 Even though the principal has all the bargaining power at the contracting stage, this need not be true at the time of settlement. By the time of settlement, their relationship has changed from being potential contracting partners to being in a “locked-in” relationship. Principal’s initial superior bargaining power, for example, due to her monopoly position in the market, will not necessarily translate to the same at the time of settlement. We, of course, remain agnostic about the relative settlement bargaining power. If the nature always chooses the principal as the offeror, the principal will extract the entire surplus conditional on having a credible litigation threat.
If, instead, the parties have equal bargaining power (nature chooses the principal (or the agent) to make the settlement offer with 50% probability), the parties will share the litigation cost saving and settle at $18. This reduces the agent’s expected sanction for not investing from $34 in a world without settlement, to $18. This provides more deterrence against breach than in the case where the agent has all the bargaining power, but it is nevertheless insufficient to stimulate efficient effort.32

Of course, the effort incentive can be restored by raising the level of liquidated damages. However, given the wealth constraint on the agent, it may be necessary to also raise the price for high-value output, and this may increase the agent’s expected rent. For example, in the case of equal bargaining power in settlement, the contract would provide efficient effort incentive by setting the high-value price at $49 and the liquidated damages at $33. The principal’s expected return from litigation if the agent fails to invest is $(2/3)(33) − $16 = $6$, and the agent’s expected loss is $(2/3)(33) + $16 = $38$. With 50-50 bargaining power, they will settle at $22. If we trace the effect of this settlement on the ex ante incentive to invest, we find that the agent earns $(3/4)(49) + (1/2)(0) − $30 = $6.75$ if he invests, and $(1/4)(49 − 22) + (3/4)(0) = $6.75$ if he does not. If, instead, the agent enjoys all the bargaining power at settlement, the contract must raise liquidated damages and high-value price even further: a high-value price of $55 and the liquidated damages at $39. The agent walks away with a sizeable rent: $(3/4)(55) − $30 = $11.25$.

The OI-contract in anticipation of settlement, therefore, is (weakly) inferior to the OI-contract when settlement is not in prospect. Part III suggested that the benefit of off-equilibrium litigation costs is that they drive a wedge between the expected return from litigation to the principal and the expected loss from litigation to the non-investing agent. Settlement undermines this wedge and increasingly so as the agent enjoys greater bargaining power. The deterrence can be restored by raising liquidated damages, but liquidated damages are a poor substitute because liability is probabilistic while litigation costs follow breach with certainty. This effect becomes more pronounced and problematic as litigation costs increase, particularly if the agent enjoys substantial bargaining power.

Nevertheless, the OI-contract with settlement performs better than the optimal O-contract in most cases, because positive settlement, no matter how small, still imposes additional punishment against the breaching agent, even when the agent has all the settlement bargaining power. Therefore, if the contract provides a credible litigation threat, the OI-contract with settlement may still dominate the O-contract.

V. Conclusion

32 With the monetary incentive of paying the agent $43 when the high value is $200, by investing, the agent’s expected return is $(3/4)(43) + (1/4)(0) − $30 = $2.25$. If the agent breaches, because he expects to lose $18 through settlement, his expected profit is $(1/4)(43 − 18) + (3/4)(0) = $6.25$. The agent would be better off not investing and paying, on average, $18 as settlement.
A contract will very rarely be able to include terms that invoke perfect and costless signals of desired performance. The task of contract design is the choice among signals that vary in their information content and in their verification costs. If the parties are faced with two costless signals that vary in information content, they should exploit both if they can. Although the parties would prefer a signal that contains more information than the one that does not, that does not imply that they will discard the less informative signal. But, what if the signals vary also in costs of verification?

This paper has shown that a costly but noisy signal can play an important role in incentive provision. Through the appropriate design of prices and damages, verification can be pushed off the equilibrium path and enhance the efficiency of performance incentives. Our analysis also indicates that “observable-but-not-verifiable” factors may not be significant obstacles to complete contracts. In this respect, we align ourselves with those who present mechanism-design solutions to verification costs, but we use a more realistic representation of the process of verification through litigation. In this manner, we underscore the importance of incorporating the verification, particularly the adjudication, process into contract design and the various choices and incentives that parties have during the contracting stage. Rather than focusing solely on the problems of adjudication or those of contracting (without sufficient regard to how the disputes will be resolved in the future), we have attempted to take a more comprehensive approach by looking at the choices the contracting parties have while paying sufficient attention to the contract dispute resolution process. We hope we have made the case for a more ambitious agenda in this regard that ultimately will account for the effect of other decisions in the enforcement process, beyond the decision to sue and to settle: for example, decisions of the defendant to respond and of both parties to present evidence. On another important track, future research must also contemplate the information asymmetry between the parties.
References


Marcel Kahan, *Causation and Incentives to Take Care under the Negligence Rule*, 18 J. Legal Stud. 427 (1989).


http://law.bepress.com/uvalwps/olin/art34


