EVIDENTIARY ARBITRAGE: THE FABRICATION OF EVIDENCE AND THE VERIFIABILITY OF CONTRACT PERFORMANCE

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Contract theory identifies verifiability as a critical determinant of the incompleteness of contracts. Although verifiability refers to the cost of proving relevant facts to a court, very little scholarship connects explicitly the evidentiary process to the drafting of substantive contract terms. This paper begins to explore this relationship to provide a more rigorous explanation of contract design. In particular, the paper concerns the very core of verifiability – truth-finding by a court – and examines the impact of the prospect of evidence fabrication on contracting. It thereby also explores the puzzling tolerance of the adjudicatory system for fabrication and the incentives to fabricate created by thresholds in burdens of proof. The paper suggests that, despite undermining truth-finding, evidence fabrication may be harnessed by contracting parties to improve the (evidentiary) cost-efficiency of performance incentives in their relationship.

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I. INTRODUCTION

Contract theory identifies verifiability as a critical determinant of the incompleteness of contracts: specifically, contracts condition obligations only on contingencies that can be verified to a court. (See, e.g., Salanie (1997), Schwartz (1992).) Verifiability in this context refers to the feasibility of establishing the truth to a court. Yet, to many contracting parties, verifiability is at best an intermediate goal. Adjudication creates value primarily through its ex ante effect on contract incentives (e.g. for performance or specific investment). Anticipating the judicial resolution of future disputes, contracting parties are likely to be interested in the likelihood or cost of judicial truth-finding only to the extent that the court’s ability to discern the truth efficiently improves contract incentives and the gains from trade.

Therefore, parties may increase their gains from trade by contracting for terms whose enforcement relies on facts that cannot be verified, but nevertheless promote efficient contract incentives. In fact, as Triantis (2002) notes, actual contracts frequently contain terms that do not seem to be verifiable to a court. More strikingly, it appears that courts are oftenfooled by fabricated, suppressed or otherwise manipulated evidence due to a number of systemic causes (Sanchirico (2004)). Perjury prosecutions are reportedly rare in civil cases and therefore scarcely deter false testimony. According to Judge Posner (1999, p. 147):

> Even judges have a certain ambivalence about perjury in civil litigation. It is not unusual for one judge to say to another that he or she has just presided at a trial at which several of the witnesses were obviously lying… I have heard expert witnesses referred to as ‘paid liars’. These comments are generally not made in a tone of indignation, and they very rarely lead to a referral to the department of justice to inquire into the possibility of an obstruction of justice. Part of this reaction is due to a sense that the court system has been designed, or at least has evolved, to be robust in the face of the known inefficacy of the oath and of the threat of prosecution for perjury… and as result, of the frequency of these crimes…

If contracting parties were concerned only about truth-finding in future adjudication, the judicial system’s leniency toward false evidence would intensify their inclination to limit agreements to
easily verifiable terms.\textsuperscript{1} In this article, however, we suggest that the parties themselves might in fact prefer to permit evidence fabrication as part of a conscious contracting strategy that emphasizes efficient performance incentives over accuracy or fairness in the resolution of disputes.

We analyze the factual determination of whether a seller has performed as promised in her contract. We provide informative sufficient conditions under which the most efficient means of providing the seller with an incentive to perform entails agreeing to contract terms that will deliberately inspire the buyer to fabricate evidence at trial of the seller’s non performance.\textsuperscript{2} We provide such conditions even under the assumption, necessary for the efficacy of evidence production, that the cost of fabricating evidence is greater than the cost of truthfully presenting it.

We allow the parties to specify in their contract a \textit{litigation payoff schedule} associating a court award with each evidentiary presentation. As Kaplow (1994, p. 327 n 49) notes, all judicial fact finding ultimately boils down to this association. Actual contracting parties have at least partial effective control over this schedule in the manner in which they write their contract, as discussed within. The extent to which parties are constrained by existing procedural and substantive doctrine in setting the litigation payoff schedule is unclear in the law, just as is the effect of adding unknown constraints in the math. As a first step, this paper investigates the limiting case in which parties have complete control over the litigation payoff schedule.

At trial, the buyer chooses how much evidence of non performance to present. The fact finder sees nothing but the buyer’s evidence production. The buyer is endowed with an amount of true evidence (her type) that is probabilistically sensitive to whether the seller performed. The buyer’s marginal cost of fabricating evidence is higher than her marginal cost of truthful evidentiary presentation. This raises the possibility that the parties can agree to a litigation payoff schedule

\textsuperscript{1} Arguably, contracts that provide for alternative dispute resolution may be opting for a better informed adjudicator and more severe reputational sanctions on evidence fabrication. Our paper raises doubts as to this motivation for preferring nonjudicial referees.

\textsuperscript{2} The model also applies to the suppression of negative evidence.
that fully reveals the buyer’s type, which is in turn a noisy but informative signal of the seller’s performance choice. Anticipating the buyer’s litigation decision, the seller decides whether to perform on the contract, balancing her cost of performance (revealed after contracting) against the extent to which performance lowers her expected liability. Anticipating both the buyer’s evidence decision problem and the seller’s prior performance decision problem, the parties choose at the time of contracting a litigation payoff schedule that optimally balances the benefits of inducing the seller to perform against the expected costs of the buyer’s evidence production.

To gain intuition for the efficiency of fabrication in our model, define the “evidentiary state” as the truly existing evidence of non performance, and “positive evidentiary states” as those states whose probability of occurring if the seller does not perform \( q \) is larger than their probability if she performs \( p < q \). As a first pass, note that a litigation payoff schedule that induces the buyer to fabricate evidence in positive evidentiary states may enhance performance incentives. Given that the buyer’s award increases in the evidence he presents, his fabrication in positive states increases the seller’s liability (and, equivalently, the buyer’s reward) in such states. This increases the seller’s incentive to minimize the probability that such states occur, which may be accomplished by performing on the contract. On the other hand, these joint surplus-maximizing contractual partners care not just about the performance incentive but also about the cost of creating it. Presumably, if fabrication is used to improve incentives, it will also increase litigation costs because fabricating evidence is more costly than truthfully presenting it.

Although valid on its own terms, such reasoning is incomplete. It neglects the fact that the contracting parties will be concerned with \( \textit{ex ante} \) breach sanctions and \( \textit{ex ante} \) litigation costs. The effect of increasing the seller’s liability in any given evidentiary state on the \( \textit{ex ante} \) incentive depends not just on the court award in that state, but also on the difference in the probabilities of
that state given performance versus given nonperformance. Similarly, the effect of presenting
truthful or fabricated evidence in any given state on ex ante litigation costs depends not just on the
cost of evidence presented in that state, but also on the ex ante likelihood of that such state will
occur. Specifically, the “weighting factors” that translate state-by-state transfers and costs into
their contribution to ex ante incentives and costs are, respectively, (1) the difference $q - p$ between
the probability of a given state if the promisor breaches less the probability if she performs, and (2)
the ex ante probability $r$ of a given state (which depends on the performance incentive). If we
focus for a moment just on these translation factors, the potential for a form of evidentiary
arbitrage becomes apparent. All else the same, the parties can reduce the cost of achieving any
given performance incentive by increasing the seller’s sanction in states in which the ratio
$r/(q - p)$ is low and reducing it appropriately where the ratio is high. The role of this ratio (and
its relation to the likelihood ratio $q/p$) is well known in the literature on optimal control and, more
specifically, mechanism design. (See, e.g., the discussion of “bang-bang” solutions in Howard
(1960) and Abreu, Pearce, and Stacchetti (1990)). In our model, however, this ratio is only one
factor determining optimality, transfers and costs in the ex post evidence signaling game being the
other. Our contribution resides in our description of how these factors interact and our connection
of this interaction to the issue of efficient fabrication. Specifically, we point out that where the
ratio $r/(q - p)$ ranges widely across different evidentiary states—and so is much greater in some
states than in others—the parties may be willing to increase the seller’s sanction in states with low
ratios even if that requires paying the greater evidentiary costs of fabrication in those states.

A numerical example in Part II provides a more elaborate illustration of these concepts. Part III
sets out our formal model. Part IV analyzes provides informative sufficient conditions for when
contracts encouraging evidence fabrication are a more efficient means of employing the legal
system to set contractual incentives. Part V offers some legal implications and an agenda for future research.

A. Related literature

Our research is related to several distinct strands of scholarship. First, most incomplete contracts scholarship assumes that verifiability is binary and exogenous (i.e., some facts are feasibly proven to courts, others are not). Recent work by Bull & Watson (2004a, 2004b) and Bull (2001), however, integrates models of evidence production with contract design. Like our model, these models specify that the fact finder sees only the evidence presented to it by the parties. However, these models assume that litigating parties may only withhold evidence, not fabricate it. Second, the endogenous type model of evidence production adopted in this paper is similar to that in Sanchirico (2001, 2000). These papers do not, however, address the question of whether or when fabrication would be efficient. Third, the conception of verifiability in contracts is addressed under the more general concern about adjudicatory accuracy in Kaplow (1994), Kaplow and Shavell (1994, 1996). (See also Spier (1994)). We share with these authors the focus on the cost efficiency of incentives provided by adjudication. In our model, however, contracting parties may not only be uninterested ex ante in investing in accuracy (as in Kaplow and Shavell (1996)), but may in fact promote the expenditure of resources to positively reduce the accuracy of adjudication. Fourth, several papers analyze the effect of random error in court decisions. (See e.g., Craswell and Calfee (1986)) In our model, the court is vulnerable to being misled by fabricated evidence in a predictable manner. Lastly, a number of papers in the mechanism design literature have examined the optimality of agent falsification in a principle-agent setting. Maggi and Rodriguez-Clare (1995), for example, show that the prospect of costly falsification may aid the principal/buyer in efficiently separating agent/seller types. In their model, the marginal cost of
falsification increases in the distance of the agent’s report from the truth, starting out at zero when the report equals the truth. In this case, marginally inducing a high cost agent to falsify by stating that he is of incrementally higher cost than he actually is produces no marginal decrease in this agent’s payoffs and so maintains satisfaction of participation constraints. On the other hand, the adjustment produces a strictly positive marginal decrease in the attractiveness for lower cost types of mimicking the high cost type: the marginal increase in the falsification required to mimic the high type is added to a strictly positive level of falsification, rather than to zero falsification. This reduction in the attractiveness of mimicking the high type produces slack in the incentive compatibility constraint at low types and so allows the principal to lower transfers to these types. Our story of optimal fabrication complements this story (and several others, including Green and Laffont (1986) and Laffont and Tirole (1993)). But it is quite different in underlying structure. The marginal cost of fabrication is constant in our model. We find the justification for inducing fabrication in the pull of probabilistic efficiency—which in turn derives from making explicit the role of the \textit{ex post} hidden information problem that is legal evidence production in the \textit{ex ante} hidden action problem that is contractual performance.

II. NUMERICAL EXAMPLE

A buyer sues a seller for breach of a contract to deliver a good. The buyer may have no evidence, low evidence, medium evidence, or high evidence of the seller’s breach. Each positive level of evidence is more likely when seller breaches than when she performs. “No evidence” is more likely when the seller performs. Thus, writing $p_i$ for the probability of evidentiary state $i$ following performance and $q_i$ for the probability of state $i$ following breach, we have $q_o < p_o$, while $q_i > p_i$ for $i = L, M, H$. 

The buyer’s cost of truthfully presenting each level of evidence at trial is $0, $1, $2, or $3 respectively. The buyer can also fabricate evidence. For example, when she truly has only low evidence, she can combine this with additional fabricated evidence in order to present medium evidence of breach. The cost of fabricating each additional level of evidence is $2. Thus, if the buyer has low evidence and fabricates up to medium evidence, her total cost is $1+$2 = $3.

After the buyer presents evidence at trial, the court may require the seller to pay some level of “damages” to the buyer. Knowing the association between evidence and damages, the buyer decides how much evidence to present (truthfully or otherwise) based on her net payoffs from different levels of presentation. For example, if she truly has only low evidence, but her recovery increases by $3 if she presents medium rather than low evidence, she can earn $3 by spending only $2 to fabricate from the low to medium level. Thus, as between truthfully presenting low evidence or partially fabricating medium evidence, she will chose the later. In other cases, the buyer may decide to withhold evidence. For example, if her litigation payoffs increase only by $.50 when she presents her actual low evidence rather than no evidence, then she would prefer to present no evidence.

Start with a litigation payoff schedule that rewards the buyer with (slightly less than) $2 additional dollars of transfer from the seller for each higher level of evidence presented. For example, if the buyer presents low evidence she gets $2, and if she presents high evidence, she gets $6. One can check that this schedule is fully revealing: it induces the buyer to present precisely the evidence that she truly has. The true evidentiary state is an informative signal of whether there was breach because the probability of each evidentiary state depends on the breach decision. Thus, breach is maximally “verifiable” under this schedule.
However, the contractual objective of the parties is to efficiently set performance incentives, not to maximize a court’s ability to verify whether there was performance. To be sure, the no-fabrication payoff schedule described above does indeed create an incentive for the seller to perform. The buyer’s award—thus, the seller’s liability—is greater in evidentiary states that are more likely following breach. Yet, this no-fabrication schedule may not be the most efficient means of creating a performance incentive. Consider an alternative schedule under which the seller pays (slightly less than) $5 if the buyer presents high evidence, and nothing for any lower level of evidence. The boundary between medium and high level of evidence under this schedule might be thought of as the plaintiff’s/buyer’s burden of proof.

Under this alternative schedule, if the buyer has no evidence, then the $6 cost to her of fabricating up to high evidence is not worth the $5 award. If the buyer has low evidence, the $5 (= $1 + $2 + $2) cost of producing high evidence is also not worth the (slightly less than) $5 award. However, if the buyer has medium evidence, then the $5 payoff from meeting the threshold of high evidence is worth the cost ( $4 = $1 + $1 + $2), even though fabrication is required. Similarly, presenting high evidence is also worthwhile for the buyer when she truly has high evidence. The court learns less about performance under this fabrication-inducing schedule than under the previous no-fabrication schedule. Here the court learns only whether or not the buyer has at least medium evidence. Yet, as we shall see, this pooling of evidentiary states may well improve the efficiency of contract incentives.

At first blush, one might believe the fabrication-inducing schedule to be inferior on two scores. First, it appears to generate less of a performance incentive. Comparing the damages paid by the seller under the no fabrication schedule in each state ($0, $2, $4, $6) with the same for the fabrication-inducing schedule ($0, $0, $5, $5), we see that the fabrication-inducing schedule’s
damages are $1 greater in the medium state ($5 versus $4), but $1 less in the high state ($5 versus $6) and $2 less in the low state ($0 versus $2). Across states, then, the fabrication-inducing schedule appears to offer $2 less of a performance incentive. Second, the fabrication-inducing schedule also seems to be more costly. Compare the evidence produced by the buyer under the no fabrication schedule in each state (none, low, medium, high) to the same for the fabrication inducing schedule (none, none, high, high). Compared to the outcome under the no-fabrication schedule, the buyer under the fabrication-inducing schedule presents one “unit” less in the low state (none versus low) and one unit more in the medium state (high versus medium). Moreover, the fabrication-inducing schedule’s additional unit of production in the medium state is fabricated, thus costing an additional $2 dollars, while the no fabrication schedule’s additional unit of production in the low state is truthfully presented, thus costing an addition $1. Across states, then, it appears that the fabrication-inducing schedule is $1 more expensive.

This analysis is flawed, however, because one cannot simply add across ex post states. Rather, one must discount the sanction and cost of each ex post state by the relevant probabilistic expression to determine that state’s contribution to the ex ante performance incentive and ex ante evidence costs. Consider first the performance incentive. To determine the performance incentive we must weight the damages in each state by that state’s probability difference, \((q_i - p_i)\). Let us suppose that the probabilities of low, medium and high evidence states given performance are 20%, 20% and 10%, while the same probabilities given breach are 15.5%, 2% and 1%. Then, the probability differences (in terms of percentage points) are 4.5, 18, and 9, respectively. Therefore, these probabilities magnify the importance of the fact that the fabrication-inducing schedule has greater damages than the no-fabrication schedule in the medium evidence state, and diminish the
importance of the fact that it has lower damages in the low and high states. Indeed, one can check that the performance incentive is the same under both schedules in this example.

Consider now the ex ante costs of each schedule. To determine the ex ante cost of each schedule, we have to multiply the ex post cost in each state by the ex ante probability of that state. The ex ante probability of each state depends on the probability that the seller breaches, the probability of each state given breach \( q_i \) and the probability of each state given performance \( p_i \). The probability of breach in our model is the chance that the seller’s performance cost—unknown at the time of contracting—is greater than the performance incentive (i.e., the expected increase in damages from not performing). Suppose here that the cost of performance is uniformly distributed between 0 and 1.5. As noted, the performance incentive is the same under the two schedules that we are comparing, and one can calculate that this is 1.35. Therefore, the probability of breach is 10%. It follows that the ex ante probability of any given state \( i \) is 10% of \( q_i \) and 90% of \( p_i \). One can calculate that the ex ante probabilities of the low, medium and high evidence states are roughly 16%, 4% and 2%.

The low evidence state is much more likely to occur than the medium or high state. Therefore, the evidence costs conditional on that state are more likely to be incurred. The no-fabrication schedule has higher evidence costs than the fabrication-inducing schedule in the low evidence state. Therefore, the no-fabrication schedule may in fact be the more expensive, contrary to our earlier impression. Some arithmetic confirms that the no fabrication schedule imposes roughly .3 in ex ante evidence costs, while the fabrication schedule imposes only .2.

Moving from the no-fabrication schedule to the fabrication-inducing schedule effectively shifts a unit of evidence production from the low state to the medium state. Although the unit of evidence that was truthfully presented in the low state under the no-fabrication schedule is now, in the
medium state, fabricated at greater ex post cost, the result is a decrease in ex ante evidence costs because the medium state is that much less likely than the low state to occur. At the same time, the probability difference is relatively large in the medium evidence state compared to the both low and high states. Therefore, the increase in damages (cf., evidence production) in that state that results from shifting from the no-fabrication schedule to the fabrication-inducing schedule is enough to offset the loss of damages in the low and high states.

As noted in the introduction, the key to the argument is the ratio \( r_i/(q_i - p_i) \) for each state. This ratio contains important information about the efficiency of sanctioning in that state: it is the contribution to ex ante costs of each dollar of evidence costs per the contribution to incentives of each dollar of transfer. When this ratio is volatile across states, the parties can improve efficiency by shifting sanctions into states with relatively low values for this ratio and out of states with relatively high values. Such an arbitrage opportunity arise in our example because the ratio in the low state (.16/.045 = 3.54) is sufficiently higher than in each of the medium and high states (.04/.18 = .21 and .02/.09 = .21, respectively).

III. Model

In phase 1, a risk neutral seller and a risk neutral buyer form a contract under which the buyer pays a price up front and the seller promises to “perform”\(^3\) at a later date. The parties also agree to a litigation payoff schedule, \( t(e) \), which instructs a future court enforcing the contract to base its damages award on the evidence, \( e \), presented by the buyer at trial and to order a transfer \( t(e) \) from seller to buyer. We assume that the schedule is binding on the courts. The parties design the payoff schedule in order to maximize their joint expected profits (as defined below) and divide the surplus by adjusting the contract price.

\(^3\) Performance might consist of the delivery of a good with particular characteristics, or the provision of a service of particular quality.
In phase 2, nature generates the seller’s performance cost, $u$, with cumulative distribution $F$ and density, $f$. In phase 3, the seller decides whether to perform under the contract. In doing so, the seller weighs the cost $u$ against the anticipated reduction, resulting from performance, in the seller’s expected payment obligation under the litigation payoff schedule. If the seller performs, the buyer enjoys value $v$.

In phase 4, nature determines the “weight” of evidence $\theta \in [0, \infty)$ actually available to the buyer. We will refer to $\theta$ variously as the “weight of available evidence,” the “buyer’s type,” and the “evidentiary state.” $\theta$ is probabilistically dependent on whether the seller has performed under the contract. If the seller has performed, the probability density of $\theta$ is $p : [0, \infty) \rightarrow \mathbb{R}$. If the seller has not performed, the density is $q : [0, \infty) \rightarrow \mathbb{R}$. We assume that the densities $q$ and $p$ are almost everywhere positive, almost everywhere non equal, and have finite expectations. If the likelihood ratio $\frac{q}{p}$ is increasing in $\theta$, a case we consider within, the probability of non performance conditional on $\theta$ increases in $\theta$, and $\theta$ represents the weight of available evidence of non performance.

In phase 5, the buyer brings suit against the seller, whether or not the seller has in fact performed. The buyer decides how much evidence $e \in [0, \infty)$ to present in court and bears the cost of evidence production. The buyer may present more or less evidence than is actually available. If the buyer presents more (i.e., if $e > \theta$), the buyer is said to “fabricate” the shortfall $e - \theta$. The unit cost for available evidence is $c_v$. The unit cost of fabricated evidence is $c_F$. The cost of presenting evidence $e$ for a buyer of type $\theta$ is thus

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4 In accord with common parlance in evidence law, we measure evidence along a single dimension, “weight.” We have found that a more complicated model that distinguishes evidentiary states along more than one dimension leads to similar results. On the other hand, employing such a multidimensional type space greatly complicates the analysis.

5 As discussed below, we assume that there are no fixed costs to bringing a law suit, so that not filing is the same as presenting no evidence. Relaxing this assumption does not alter the qualitative results of the model.
\[ c(e, \theta) = \begin{cases} 
  c_r e, & e \leq \theta \\
  c_r \theta + c_r (e - \theta), & e > \theta 
\end{cases} \quad (1) \]

Unless otherwise noted, we assume \( \infty > c_r > c_r > 0 \). In choosing how much evidence \( e \) to present, a buyer of type \( \theta \) balances the cost of evidence against the positive effect that such evidence will have on his winnings in court. In particular, he chooses \( e \) to maximize \( t(e) - c(e, \theta) \).\(^6\)

In phase 6, the court “rules.” The court observes neither whether the seller performs, nor the weight of evidence \( \theta \) actually available to the buyer, but only the evidence \( e \) produced by the buyer.\(^7\) Given the buyer’s choice of \( e \), the court orders the seller to pay \( t(e) \) to the buyer.

A. Direct mechanisms and incentive compatibility

As usual, it is more convenient—and equivalent—to imagine that the parties contract directly over \((e(\theta), t(\theta))\) limiting their attention to such direct (litigation) mechanisms that are incentive compatible.\(^8\) A direct mechanism \((e(\theta), t(\theta))\) is incentive compatible if for all \( \theta, \theta' \in [0, \infty) \),

\[ t(\theta) - c(e(\theta), \theta) \geq t(\theta') - c(e(\theta'), \theta) . \quad (2) \]

Each type \( \theta \) must (weakly) prefer the evidence and transfer “assigned” to her by the direct mechanism to the evidence and transfer assigned to any other type \( \theta' \).

\(^6\) The model does not include evidence production by the seller. But we can think of the problem studied here as that of choosing a particular slice—corresponding to a fixed level of seller evidence—of an overall mechanism wherein both parties present evidence. Fabrication in a slice implies fabrication in the overall mechanism. Further, because we consider only the buyer’s evidence production, however, our mechanism does not take advantage of correlation between seller and buyer types. Yet, in a litigation context, correlated types are not the panacea that they may (or may not) be in other contexts. In short, with fixed costs of hearings, the full rank condition can be costly to fulfill. (See Sanchirico (2000)). Therefore, the legal system will efficiently employ the kind of endogenous type signaling that we study here to some extent, and to that extent fabrication will be part of the efficient litigation mechanism.

\(^7\) If the court could directly observe the buyer’s type, rather than just the evidence that the buyer chooses to send, our model would correspond to the classic moral hazard/hidden action problem. In particular, if this type-informed fact-finder assessed upon the parties a fixed fee for imposing each dollar of liability on the seller, our model would yield a “bang-bang” solution. Under a bang-bang solution all liability would be concentrated in the single state with the lowest \( r(q-p) \) ratio, as defined below in the text. The inability of the fact-finder to observe type and the resulting use of evidence as a costly signal thereof masks the bang-bang result. The extent to which fabrication is optimal is directly related to the extent to which the same considerations producing the bang-bang result still exert force in our model.

\(^8\) As is standard, we consider only piecewise continuously differentiable mechanisms. We adapt the usual definition of piecewise continuous differentiability to our unbounded type space as follows: within any interval of finite length there are no more than a finite number of points at which the mechanism is not continuously differentiable.
B. *Expected gains from performance at contracting*

The seller performs if and only if

\[
\inf_0^\infty \left( u - \int_0^\infty t(\theta) p(\theta) d\theta \right) \geq \inf_0^\infty \left( -\int_0^\infty t(\theta) q(\theta) d\theta \right) \iff u \leq \inf_0^\infty \left( t(\theta)(q(\theta) - p(\theta)) \right) d\theta \equiv \Delta \tag{3}
\]

We refer to $\Delta$ as the *performance incentive*. This is a weighted sum of transfers with weights equal to the extent to which non performance increases the state’s likelihood.

Given $\Delta$, the expected joint gain from performance at contracting is:

\[
G(\Delta) = \int_0^\Delta f(u)(v-u) du \tag{4}
\]

The upper limit of integration reflects the condition for performance in (3). Were performance costlessly observable by the court, the optimal litigation mechanism would satisfy $\Delta = \nu$.

Litigation costs, however, may upset this conclusion; such costs are not minimized at $\Delta = \nu$.

Because marginal litigation costs may be increasing or decreasing over any given range, the performance incentive created by the optimal mechanism may be greater than or less than $\nu$. (See Polinsky and Rubinfeld (1988) and Sanchirico (2001))

C. *Expected litigation costs at contracting*

Given $\Delta$, the probability that the seller performs is $F(\Delta)$. Therefore, the *density* of $\theta$ at contracting is $r(\Delta, \theta) \equiv F(\Delta) p(\theta) + (1 - F(\Delta)) q(\theta)$. Given $\left(t(\theta), e(\theta)\right)$ and the resultant $\Delta$, expected litigation costs at contracting are

\[
C(e(\cdot), \Delta) = \int_0^\infty c(e(\theta), \theta) r(\theta, \Delta) d\theta. \tag{5}
\]
The expression averages evidence costs across all states, weighting each by its probability at contracting.

D. *The optimal contract and the sub problem of cost minimization*

At contracting the parties choose an incentive compatible litigation mechanism that maximizes expected joint profits, \( G(\Delta) - C(e, \Delta) \). This choice problem can be decomposed into two steps. First, the parties find, for each level of \( \Delta \), an incentive compatible litigation mechanism that generates \( \Delta \) at the lowest possible expected litigation cost. Write \( C(\Delta) \) for this minimum cost (which may be infinite). Second, the parties choose the \( \Delta \) that maximizes \( G(\Delta) - C(\Delta) \). To show that efficient contracting might deliberately induce fabrication, it suffices to consider the first step—the minimum cost generation of a given performance incentive. Therefore, we restrict attention to this sub-problem throughout the rest of the paper. Note that given \( C(\Delta) \), we can adjust the distribution of \( u \) to produce any \( G(\Delta) \) and therefore make any \( \Delta \) optimal.

E. *Normalization of transfers and the buyer’s decision to sue*

Adding a constant \( k \in \mathbb{R} \) to \( t(\theta) \) affects neither the performance incentive (3) nor incentive compatibility (2). Furthermore, \( t(\theta) \) enters into expected litigation costs (5) only through the performance incentive, which, as noted, is unaffected by the translation. Therefore, if two mechanisms \( (e,t) \) and \( (e',t') \) differ only in that \( t = t' + k \), then these mechanisms are equivalent for both overall contract design and the sub-problem of cost minimization. Thus, from each equivalence class of mechanisms so related by translation of transfers we need only evaluate one
representative. Throughout the rest of the paper, we will restrict attention to representatives whose transfers satisfy
\[ t(0) - c(e(0), 0) = 0. \] (6)

Combined with incentive compatibility this normalization has several straightforward implications: 9

**Lemma 1:** In any incentive compatible litigation mechanism \((e(\theta), t(\theta))\), for all \(\theta: 1) t(\theta) - c(e(\theta), \theta) \geq 0; 2) t(\theta) \geq 0; and 3) \(t(\theta) = 0 \iff e(\theta) = 0\).

Implication 1) renders superfluous a litigation participation constraint for the buyer. Even so, our analysis does effectively accommodate litigation mechanisms that induce the buyer to refrain from suing in certain states. This is because not filing suit is equivalent to presenting zero evidence in our model: presenting zero evidence incurs no costs and must result in a zero transfer, as indicated in implication 3). Implication 2) will be useful in subsequent proofs.

**IV. Analysis**

Given any incentive \(\Delta > 0\), the parties effectively seek to minimize the average cost \(\frac{C(\Delta)}{\Delta}\) of providing it. This average cost may be recast as the integration of three factors:

\[ \frac{C(\Delta)}{\Delta} = \int_0^\infty [\frac{c(e(\theta), \theta)}{\Delta} \frac{\Delta}{q-p}] \, \frac{c(e(\theta), \theta)}{\Delta} \, d\theta, \] (7)

where we adopt the convention that \(c(e(\theta), \theta)/t(\theta) = 1\), if \(t(\theta) = 0\). Our analysis is structured around a review of each factor. The third factor, \(c(e(\theta), \theta)/t(\theta)\) is state \(\theta\)’s ex post transfer price—i.e., the evidence cost per dollar transferred from seller to buyer. All else the same, the

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9 On the other hand, several typical results do not hold in our model. For instance, evidence costs do not satisfy a strict single crossing property: a strictly higher type does not have strictly greater incremental evidence costs at all levels of evidence. Consequently, incentive compatibility does not imply that evidence production is even weakly increasing in type. For example, it is consistent with incentive compatibility to have \(\theta = 100\) present \(e=50\), while \(\theta = 200\) presents only \(e=40\). Note also that \(c\) is not differentiable everywhere, rendering the usual solution methods unavailable.
parties prefer a mechanism that delivers transfers at low ex post prices. In next section, we demonstrate that over the set of incentive compatible litigation mechanisms this price is bounded from above and away from zero. Moreover, we show that from the standpoint of ex post transfer prices, a certain kind of no-fabrication schedule dominates any schedule inducing fabrication.

The second factor \( r(\theta, \Delta)/(q(\theta) - p(\theta)) \) translates the state \( \theta \)'s ex post transfer price into the state \( \theta \)'s ex ante incentive price, \( r(\theta, \Delta)/(q(\theta) - p(\theta)) \times c(e(\theta), \theta)/t(\theta) \). The factor \( r(\theta, \Delta)/(q(\theta) - p(\theta)) \) reflects \( \theta \)'s probabilistic efficiency, given performance incentive \( \Delta \).

States with large probability differences \( q(\theta) - p(\theta) \) but small ex ante probabilities \( r(\theta, \Delta) \) offer a large incentive bang for the buck: their likelihood is sensitive to non-performance, yet they rarely occur in any event, and so the evidence cost is rarely incurred. Given that the seller’s nonperformance increases \( \theta \)'s likelihood by .10, for example, better if that difference spans from .05 to .15 than from .80 to .90.

We consider the first factor \( t(\theta)(q - p)/\Delta \) in conjunction with the second, defining

\[
\rho \equiv \int_0^\infty \frac{(q(\theta) - p(\theta))}{\Delta} \frac{r}{q - p},
\]

which we refer to as the probabilistic inefficiency of mechanism. This is the weighted average of the \( r/(q - p) \) translators with weights equal to the state’s share of the overall incentive. The statistic \( \rho \) reflects the extent to which the litigation mechanism makes use of probabilistically efficient states in setting incentives. As we shall see, fabrication-inducing mechanisms have more latitude than no-fabrication mechanisms in allocating incentive provision to probabilistically efficient states.
A. Bounds on the ex post transfer prices

**PROPOSITION 1:** If a litigation mechanism is incentive compatible, then at all states \( \theta \),
\[
\frac{c_\theta}{c_\theta} \leq \frac{c(e(\theta), \theta)}{n(\theta)} \leq 1.
\]

Were the price of transfers at \( \theta \) greater than 1, a type \( \theta \) buyer would mimic a type \( \theta = 0 \) buyer, thus obtaining non negative rather than negative litigation payoffs. On the other hand, as we show in the proof, a type \( \theta = 0 \) buyer would prefer to mimic a type \( \theta \) buyer were the price of transfers at \( \theta \) lower than \( \frac{c_\theta}{c_\theta} \).

The bounds in Proposition 1 are tight, as can be established by examining two special types of litigation mechanisms (both of which play a role in subsequent analysis). A *canonical no-fabrication mechanism* is a mechanism wherein \( e(\theta) = \theta \) and \( t(\theta) = c_\rho \theta \) up to some level \( \bar{\theta} \), after which both evidence and transfers remain constant at \( \bar{\theta} \) and \( c_\rho \bar{\theta} \) respectively. This schedule is normalized, incentive compatible, induces no fabrication, and attains the lower bound in Proposition 1 at all \( \theta \). In a *threshold mechanism*, types \( \theta \geq \bar{\theta} > 0 \) each present \( \bar{e} \) and receive \( \bar{T} \), while types \( \theta < \bar{\theta} \) present nothing and receive no transfer. Such a schedule is normalized, and is incentive compatible if and only if \( \bar{T} = c(\bar{e}, \bar{\theta}) \). Threshold mechanisms may or may not induce fabrication. Every incentive compatible threshold mechanism attains the upper bound at all \( \theta \leq \bar{\theta} \). A *no-fabrication* threshold schedule remains there at all types \( \theta \geq \bar{\theta} \), while a *fabrication-inducing* threshold schedule falls *below* the upper bound at all types \( \theta \geq \bar{\theta} \).

From these two classes of litigation mechanisms we can learn much about ex post efficiency and fabrication. Despite the fact that fabricating a unit of evidence is always more expensive than truthfully producing it, no-fabrication schedules are not universally superior to fabrication-inducing schedules in terms of ex post transfer prices. Within the class of threshold mechanisms,
fabrication-inducing mechanisms dominate no-fabrication mechanisms because only the former fall below the upper bound at types $\theta \geq \Theta$. However, within the class of all incentive compatible mechanisms the ex post efficiency story is different. As noted, canonical no-fabrication mechanisms are everywhere at the lower bound. On the other hand, the logic establishing that lower bound can also be applied to show that every fabrication-inducing schedule must exceed the lower bound at all types where it induces fabrication. Therefore, with regard to ex post transfer prices, canonical no-fabrication mechanisms “weakly dominate” fabrication-inducing mechanisms: the former are nowhere more expensive and somewhere less expensive. Thus, fabrication is ex post inefficient.

B. Probabilistic efficiency

As our decomposition (7) indicates, however, ex post transfer prices are not the only consideration determining the overall efficiency. If $r/(q-p)$ varies widely across states, then some states will be markedly more probabilistically efficient than others. This will in turn produce a desire to shift incentive production toward such low $r/(q-p)$ states. This desire may be intense enough to overwhelm the ex post transfer price advantage of no-fabrication mechanisms.

More formally, compare the cost of two incentive compatible mechanisms $(e,t)$ and $(e',t')$ both generating $\Delta$. Asking whether $(e',t')$ is less expensive is the same as asking whether it has a lower weighted average from (7):

$$\int_0^\infty \frac{c(\theta) (q-p)}{\Delta} \frac{c'_{e'}(\theta)}{c_{e'}(\theta)} \frac{r-q}{q-p} < \int_0^\infty \frac{c(\theta) (q-p)}{\Delta} \frac{c'_{e}(\theta)}{c_{e}(\theta)} \frac{r-q}{q-p}.$$  

Substituting the worst-case ex post transfer price across all types, $c_{e'}(\theta) / c_{e}(\theta) = 1$ for $(e',t')$ and the best-case

$$\frac{c(e(\theta),\theta)}{c_{e}(\theta)} = \frac{c_{e}}{c_{e'}}$$  

for $(e,t)$, we may conclude that $(e',t')$ is less costly if

$$\int_0^\infty \frac{c(\theta) (q-p)}{\Delta} \frac{r-q}{q-p} < \frac{c_{e}}{c_{e'}} \int_0^\infty \frac{c(\theta) (q-p)}{\Delta} \frac{r-q}{q-p}.$$
Substituting next from the definition of $\rho$ yields $\frac{\rho'}{\rho} < \frac{c_T}{c_F}$. Therefore, if we define $\frac{c_T-c_F}{c_F}$ to be the fabrication premium and $\frac{c_T-c_F}{c_F}$ to be $(e',t')$'s probabilistic efficiency advantage over $(e,t)$, we have:

**Proposition 2:** Given two incentive compatible litigation mechanisms $(e,t)$ and $(e',t')$, both generating performance incentive $\Delta$, in order to conclude that $(e',t')$ imposes strictly lower ex ante evidence costs than $(e,t)$, it suffices that $(e',t')$'s probabilistic efficiency advantage over $(e,t)$ exceeds the fabrication premium: i.e., $\frac{c_T-c_F}{c_F} > \frac{c_T-c_F}{c_F} \iff \frac{\rho'}{\rho} < \frac{c_T}{c_F}$.

The next step is to provide conditions under which the probabilistic efficiency advantage of fabrication-inducing mechanisms over no-fabrication mechanisms exceeds the fabrication premium. Before doing so, however, let us pause to consider several informative limiting cases. First, when there is no cost to truthful evidence production ($c_T = 0$) but a positive cost to fabrication ($c_F > 0$), fabrication is never optimal: $^{10}$ ex ante costs are zero for all no-fabrication schedules and positive for all fabrication-inducing schedules.

Second, when there are no “false positives”—i.e., $p(0) = 1$; $p(\theta) = 0, \forall \theta > 0$—$r/(q-p)$ is constant at $1-F(\Delta)$ for all $\theta > 0$. Moreover, positive transfers at $\theta = 0$ reduce the incentive, while adding to evidence costs. As we show in Appendix Proposition A1, the canonical no-fabrication mechanism is an efficient means of producing $\Delta$ in this case, whereas fabrication-inducing mechanisms are never efficient. In intuitive terms, the canonical no-fabrication schedule makes no transfers at $\theta = 0$ and minimizes ex post transfer prices at all $\theta > 0$, which is the only consideration on $(0,\infty)$ because $r/(q-p)$ is constant in this range. A fabrication-inducing schedule, on the other hand, either transfers at $\theta = 0$ or, as noted above, exceeds the lower bound

$^{10}$ This assumes that $\Delta$ can be produced with some no-fabrication schedule. In general fabrication allows the production of greater performance incentives. This is another sense in which fabrication can be (vacuously) optimal.
on ex post transfer prices wherever it induces fabrication. In sum, then, the efficiency of fabrication requires both false positives (as defined above) and positive costs for truthful evidence production.

C. **Sufficient condition for efficient fabrication: increasing likelihood ratio**

In this section we provide a condition for the existence of a fabrication-inducing mechanism whose probabilistic efficiency advantage over any no-fabrication mechanism exceeds the fabrication premium. By Proposition 2, this enables us to conclude that fabrication is optimal. We provide this condition under the natural assumption that the likelihood ratio \( \frac{q}{p} \) is increasing in \( \theta \). Defining \( \underline{\rho} \) to be the greatest lower bound on \( \rho \) among all litigation mechanisms, incentive compatible or not, we show that \( \rho \) is bounded away from \( \underline{\rho} \) within the class of no-fabrication mechanisms generating \( \Delta \), yet approaches \( \underline{\rho} \) within the class of all schedules generating \( \Delta \). We use this to conclude that fabrication will be optimal, if the likelihood ratio increases with sufficient rapidity so as to cause \( \underline{\rho} \) to be sufficiently small.

1. **The likelihood ratio and \( \frac{r}{q-p} \)**

Where \( q > p \), \( \frac{r}{q-p} \) is strictly decreasing in \( \frac{q}{p} \).\(^{11}\) Furthermore, under the assumption that \( \frac{q}{p} \) is strictly increasing, \( q \) and \( p \) must cross precisely once, with \( q \) cutting \( p \) from below. Therefore, after some point \( \theta^* \), \( q > p \), and for lower types \( q < p \). Thus, above \( \theta^* \), \( \frac{r}{q-p} \) is strictly decreasing.

\(^{11}\) Where \( q-p, r/(q-p) \) is negative and also strictly decreasing in \( q/p \). But \( r/(q-p) \) is not decreasing between two points straddling \( q/p = 1 \).
2. Lower bound on $\rho$ for no-fabrication mechanisms

For purposes of gaining intuition, focus on types above $\theta^*$, where $q > p$ and $r/(q - p)$ is strictly decreasing. We reduce $\rho$ by allocating more transfers onto higher types where $r/(q - p)$ is lower. A no-fabrication schedule is constrained in the extent to which it can load transfers onto high types. Every incentive compatible schedule must have $t(\theta) \leq c_r e(\theta)$ to prevent $\theta = 0$ from mimicking $\theta$. For no-fabrication mechanisms, this implies $t(\theta) \leq c_r \theta$. Thus, although transfers can grow without bound as $\theta$ increases, they are bounded at any given type $\theta$. Now broaden the set of mechanisms under consideration to include all mechanisms satisfying $t(\theta) \leq c_r \theta$ and generating $\Delta$, whether or not they are incentive compatible and prevent fabrication. Intuitively, minimizing $\rho$ over this extended set means starting $t(\theta) = c_r \theta$ at the highest $\theta$ that will still allow us to attain $\Delta$. This is illustrated in Figure 1. The minimum thus attained must be a lower bound for the subset of incentive compatible no-fabrication schedules generating $\Delta$. This reasoning is formalized in Proposition 3 and its proof:

**Proposition 3:** Suppose that the likelihood ratio $\frac{q}{p}$ is strictly increasing. For all incentive compatible no-fabrication mechanisms generating performance incentive $\Delta$,

$$\rho \geq \int_{\theta(\Delta)}^{\infty} \frac{c_r \theta (q - p)}{\Delta} \frac{r}{q - p} \, d\theta,$$

where $\theta(\Delta)$ is the highest $\theta$ satisfying $\int_{\theta(\Delta)}^{\infty} c_r \theta (q - p) = \Delta$.

3. Lowest $\rho$ allowing fabrication

For purposes of gaining intuition, restrict attention to mechanisms that provide zero transfers at types below $\theta^*$. In this case $\rho$ is a non negatively weighted average of $r/(q - p)$. Therefore, $\rho$
can be no lower than \( \inf_{\theta \geq \theta^*} \frac{r}{(q - p)} \), which under the assumption of an increasing likelihood ratio is \( \lim_{\rho \to \infty} \frac{r}{(q - p)} = \rho \).\(^{12}\) For any \( \Delta \), \( \rho \) is approachable with threshold mechanisms, as illustrated in Figure 2. Recall that a threshold mechanism is incentive compatible if \( \mathcal{T} = c(\bar{\theta}, \bar{T}) \).

Such a mechanism provides the requisite incentive \( \Delta \) if \( \int_{\bar{T}}^{\infty} (q - p) = \Delta \). Therefore, for any threshold type \( \bar{\theta} \), however large, there exists a transfer level \( \bar{T} \) large enough to deliver \( \Delta \).\(^{13}\)

Moreover, there also exists an \( \bar{e} \) that in combination with \( \bar{\theta} \) and \( \bar{T} \) defines an incentive compatible mechanism. The probabilistic inefficiency \( \rho \) of a threshold mechanism is

\[
\int_{\bar{T}}^{\infty} \frac{(q - p) - \rho}{q - p} \cdot \frac{r}{q - p}.
\]

This weighted average is no larger than \( \frac{r(\bar{\theta})}{(q(\bar{\theta}) - p(\bar{\theta}))} \). Therefore, within the set of threshold mechanisms generating \( \Delta \), \( \rho \) approaches \( \rho \) as \( \bar{\theta} \) increases to infinity (and \( \bar{T} \) and \( \bar{e} \) increase in tandem).

**PROPOSITION 4:** Suppose the likelihood ratio \( \frac{q}{p} \) is increasing. We can find an incentive compatible mechanism generating performance incentive \( \Delta \) whose \( \rho \) is arbitrarily close to

\[
\rho = \lim_{\rho \to \infty} \frac{r}{q - p} \cdot \frac{\rho(q - p)}{q - p},
\]

which is the greatest lower bound on \( \rho \) across all litigation mechanisms.

4. **Condition for efficient fabrication**

Given \( \Delta \), suppose the following condition, stated solely in terms of parameters and \( \Delta \), obtains:

\[
\lim_{\theta \to \infty} \frac{r}{q - p} < \frac{c_F}{c_F} \int_{\theta(\Delta)}^{\infty} \frac{c_F(\theta - p)}{q - p} \cdot \frac{r}{q - p} \cdot \frac{\rho(q - p)}{q - p}.
\]

Then by Proposition 4, there is some incentive compatible mechanism \( (\hat{\epsilon}, \hat{t}) \) whose \( \hat{\rho} \) satisfies

\[\text{\textsuperscript{12}}\text{This limit exists, is finite, and is no less than } 1 - F(\Delta) \text{. Adding positive transfers at types below } \theta^* \text{ would only increase } \rho \text{ : both } r(\theta)(q - p) \text{ and } \frac{r}{q - p} \text{ would be negative; further, we would have to increase transfers above } \hat{\theta}^* \text{ to maintain deterrence.}\]

\[\text{\textsuperscript{13}}\text{The construction here may not be feasible with wealth constraints. But if wealth constraints are not too severe relative to the speed at which } r/(q - p) \text{ falls, then the lowest attainable } \rho \text{ given the wealth constraint will still be small enough to conclude that fabrication is efficient. Note also that wealth constraints will increase the lower bound on } \rho \text{ for no-fabrication schedules.}\]
\[
\hat{\rho} < \frac{c_f}{c_v} \int_{\Theta(\Delta)}^{\infty} \frac{c_f \theta(q-p)}{\Delta} \frac{r}{q-p}
\]

Furthermore, we know from Proposition 3 that \( \rho \geq \int_{\Theta(\Delta)}^{\infty} \frac{c_f \theta(q-p)}{\Delta} \frac{r}{q-p} \) for every no-fabrication mechanism generating \( \Delta \). Therefore, we can conclude that: 1) \((\hat{e}, \hat{i})\) induces fabrication; and 2) compared to any incentive compatible no-fabrication schedule, \((\hat{e}, \hat{i})\) satisfies \( \hat{\rho} > \frac{c_f}{c_v} \). By Proposition 2, this in turn implies that \((\hat{e}, \hat{i})\) delivers incentive \( \Delta \) at lower expected cost than any no-fabrication schedule. Thus, (10) is a sufficient condition for the optimality of fabrication.

Rearranging (10) produces the follow proposition connecting variability in \( r_{qp} \) with the efficiency of inducing fabrication:

**PROPOSITION 5:** Suppose that the likelihood ratio \( \frac{q}{p} \) is strictly increasing. Given performance incentive \( \Delta \) consider the weighted average over all \( \Theta \geq \Theta(\Delta) \) of the percentage decline in \( \frac{r}{q-p} \) from \( \Theta \) to \( \infty \):

\[
\int_{\Theta(\Delta)}^{\infty} w_{\Theta} \frac{r}{q-p} = \lim_{\Theta(\Delta) \to \infty} \frac{r}{q-p}
\]

where \( w_{\Theta} = \frac{c_f \theta(q-p)}{\Delta} \). If this weighted average exceeds the fabrication premium \( \frac{c_f-c_v}{c_v} \), then fabrication is efficient.

**V. IMPLICATIONS AND EXTENSIONS**

Our project was motivated by the received wisdom in contract theory that parties only contract over actions and contingencies that are verifiable. There is considerable ambiguity as to what “verifiability” means. We argue that the concept itself fails both in theoretical relevance and in empirical support. Courts in civil actions make determinations of complex facts on the basis of the balance of probabilities. They are often mistaken in their fact finding because they are misled by

\[\text{14 These weights add to one and are nonnegative. Also, recall: } \lim r/(q-p) \geq 1 - F(\Delta).\]
one or both parties. This paper is premised on the assumption that contracting parties are less concerned about whether the court learns the truth, and more concerned about increasing the value of their contract, which depends on performance incentives and enforcement costs rather than the future discovery of truth. As a general matter, therefore, we hope to shift the focus of incomplete contract models away from verifiability. In particular, whether a term of performance is contractible should be determined in part by probabilistic efficiency, rather than solely by reference to the court’s ability to determine the truth. This approach may reveal that a wider range of terms are contractible than contract theory currently suggests.

Parties in the real world frequently contract over performance standards and contingencies that are patently not verifiable: in the sense that they contemplate costly litigation in which there is a good chance that a court will not find the truth. For example, they often contract for performance that is “reasonable” rather than specifying easily verifiable dimensions of performance and omitting nonverifiable dimensions. Indeed, some terms in practice are patently manipulable, such as accounting measures. These contract terms invite the introduction of costly fabricated evidence at trial. However, our analysis suggests that this may indeed improve incentive efficiency.

Our analysis may also sheds new light on the all-or-nothing character of burdens of proof. In particular, a plaintiff is not entitled to any remedy until she satisfies the burden of proof threshold. And, once that threshold is passed, the plaintiff receives no additional remedy for surpassing it by a larger margin. Suppose that the threshold entails $e^*$. It is clear that, depending on the cost of fabrication, at least some of the plaintiffs with truthful evidence that falls short of $e^*$ are likely to be induced to fabricate up to that level and receive the remedy. Assume for the sake of argument that the plaintiff who has no evidence has no incentive to fabricate to the proof threshold. The plaintiffs with truthful evidence greater than $e^*$ cannot increase their recovery by spending more on
evidence production, and therefore they withhold the balance of their actual evidence. As a result of these evidentiary incentives, the court has much less accurate information as to how much actual evidence exists and consequently, the probability that the alleged event occurred. Without the benefit of our analysis, one might think that this evidentiary pooling would undermine deterrence. Even if it did not, deterrence seems to be attained at a higher evidence cost than a mechanism that deterred fabrication and rewarded the plaintiff incrementally for each unit of truthful evidence she presented. However, we demonstrate in this paper that the burden-of-proof mechanism may in fact lower the evidence cost of the deterrence if the evidentiary states above e* have lower probabilistic efficiency than the states below e*. Thus, in at least some cases, this may be a justification for the nonlinear payoff schedule associated with burdens of proof.

The litigation payoff schedule used in our analysis is a modeling construct. Parties may try to condition liquidated damages directly on evidence production. This is more likely to succeed if their disputes are arbitrated because the state’s rules of evidence and procedure are generally mandatory. Nevertheless, as Kaplow (1994) suggests, law makers have considerable discretion through the definition of substantive legal obligations.15 Contracting parties, in particular, can specify distinct or grouped performance obligations and can assign separate or aggregate liquidated damages for the breach of the respective obligations. In addition, the parties may express the obligations more or less like rules or standards.

Our analysis may be extended in several directions. First, we have shown how the parties can exploit variations over evidence states in probabilistic efficiency. They might alternatively be able to exploit variations in the difference between the cost of fabricated and truthful evidence production. For example, it might be that the marginal cost of truthful presentation increases faster than the marginal cost of fabrication. This too would inform how incentive provision were

15 Kaplow, Accuracy in Adjudication, supra note --, at 308, 333, 358 n.358, 363n159.
allocated across states. Second, we have focused on the evidentiary choices and costs of promisee plaintiffs. We believe that a model where the promisor sues to recover the contract price and must prove performance would similarly indicate that there are conditions under which a price schedule that induces fabrication by the promisor yields the most efficient performance incentive. Third, the model may be further extended to consider the joint evidentiary strategies of both sides. Fourth, future models should also incorporate the effects of settlement and contract renegotiation.

VI. TECHNICAL APPENDIX

Throughout the appendix, “IC” refers to incentive compatibility and “N” to normalization.

PROOF OF LEMMA 1: 1): \( \forall e, \theta, c(e, 0) \geq c(\theta) \). Therefore, \( t(0) - c(e(0), 0) = 0 \) implies \( t(0) - c(e(0), \theta) \geq 0, \forall \theta. \) The result follows from IC. 2): Immediate from 1). 3):

\( t(\theta) = 0 \Rightarrow e(\theta) = 0 \) is immediate from 1). Conversely, N and IC imply

\[
0 = t(0) - c(e(0), 0) \geq t(\theta) - c(e(\theta), 0) = t(\theta),
\]

which combined with 2) yields the result.

PROOF OF PROPOSITION 1: The upper bound is obvious. For the lower bound, we have

\[
c(e(\theta), \theta) \geq c_r e(\theta).
\]

Moreover, IC and N imply \( t(\theta) - c_r e(\theta) = t(\theta) - c(e(\theta), 0) \)

\[
\leq t(0) - c(e(0), 0) = 0.
\]

Combining yields the bound. QED

PROOF OF PROPOSITION 3: Given that \( q - p < 0 \) at some states, we wish to choose \( t(\theta) \) to minimize \( \rho \) subject to: a) \( t(\theta) \leq c_r \theta \) for all \( \theta \); and b) \( \int_0^\theta (q - p) = \Delta \). Consider the schedule,

\[
\forall \theta < \theta(\Delta), t(\theta) = 0; \forall \theta \geq \theta(\Delta), t(\theta) = c_r \theta,
\]

and its corresponding \( \rho \). By definition,

\[
\theta(\Delta) \geq \theta'.
\]

Suppose, then, that there exists \( t' \) satisfying constraints a) and b) such that \( \rho' < \rho \).
We may assume that $t'(\theta) = 0$, $\forall \theta < \theta'$. If not, we may adjust $t'$ to $t''$ by setting $t''(\theta) = 0$, $\forall \theta < \theta'$ and $t''(\theta) = \alpha t'(\theta)$, $\forall \theta \geq \theta'$, where $\alpha$ is chosen to maintain $\Delta$. By definition of $\theta'$, $\alpha < 0$. Therefore, $t''$ has even lower $\rho$ than $t'$. Moreover, it still satisfies a) and b).

By definition of $t$, a) and b), we have $t(\theta) \leq t'(\theta)$, $\forall \theta \in [\theta', \theta(\Delta)]$ and $t(\theta) \geq t'(\theta)$, $\forall \theta \in [\theta(\Delta), \infty)$. But, more than this, because $\rho' < \rho$, $t'(\theta) - t(\theta) > 0$ on some positive measure subset of $[\theta', \theta(\Delta)]$. For if $t'(\theta) - t(\theta) = 0$ almost everywhere on $[\theta', \theta(\Delta)]$, then $t'$ would have to differ from $t$ on a positive measure subset of $[\theta(\Delta), \infty)$ wherein $t(\theta) = c_p \theta$. Given $t'(\theta) \leq c_p \theta$, this implies that $t'$ offers a lower incentive, a contradiction.

Combining these inequalities with the fact that $r/(q - p)$ is strictly decreasing after $\theta^*$ we arrive at the following contradiction of our hypothesis that $\rho' < \rho$:

$$
\rho' - \rho = \int_{\theta'}^{\theta(\Delta)} \frac{(t' - t)(q - p)}{\Delta} \frac{r}{q - p} + \int_{\theta(\Delta)}^{\infty} \frac{(t' - t)(q - p)}{\Delta} \frac{r}{q - p} > \int_{\theta'}^{\theta(\Delta)} \frac{(t' - t)(q - p)}{\Delta} \frac{r(\theta(\Delta), \Delta)}{q(\theta(\Delta)) - p(\theta(\Delta))} + \int_{\theta(\Delta)}^{\infty} \frac{(t' - t)(q - p)}{\Delta} \frac{r(\theta(\Delta), \Delta)}{q(\theta(\Delta)) - p(\theta(\Delta))}
$$

$$
\approx \int_{\theta'}^{\theta(\Delta)} \frac{(t' - t)(q - p)}{\Delta} + \int_{\theta(\Delta)}^{\infty} \frac{(t' - t)(q - p)}{\Delta} = 0,
$$

where the last equality follows from the fact that $t$ and $t'$ generate the same incentive. QED

PROOF OF PROPOSITION 4: It suffices to supplement the discussion in the text with proof of the statement that $\rho \geq \inf_{\theta \geq \theta'} \frac{r}{q - p}$ for all mechanisms. Suppose, on the contrary, that for some $e, t$

$$(e, t) \int_{0}^{\infty} \frac{q(\theta)(q - p)}{\Delta} \frac{r}{q - p} < \inf_{\theta \geq \theta'} \frac{r}{q - p}.$$ Since $\int_{0}^{\infty} \frac{q(\theta)(q - p)}{\Delta} = 1$, this is the same as

$$
\int_{0}^{\infty} \frac{q(\theta)(q - p)}{\Delta} \left( \frac{r}{q - p} - \inf_{\theta \geq \theta'} \frac{r}{q - p} \right) < 0. \text{ Because } \frac{r}{q - p} - \inf_{\theta \geq \theta'} \frac{r}{q - p} \geq 0 \text{ when } \theta \geq \theta', \text{ this implies}
$$
But given that $q < p$ when $\theta < \theta^*$, this is impossible, as shown by the signing in (11). QED

PROOF OF PROPOSITION 5: We may rewrite the condition in the text as

$$\frac{c_{\theta^*}}{c_{\theta}} \mathcal{P} < \int_{\theta(\Delta)} \frac{e_{\theta}(q-p)}{\Delta} \frac{r}{q-p} \cdot$$

Subtracting $\mathcal{P}$ from both sides and using

$$\int_{\theta(\Delta)} \frac{e_{\theta}(q-p)}{\Delta} = 1,$$

yields

$$\frac{c_{\theta^*}}{c_{\theta}} \mathcal{P} < \int_{\theta(\Delta)} \frac{e_{\theta}(q-p)}{\Delta} \left( \frac{r}{q-p} - \mathcal{P} \right).$$ QED

PROPOSITION A1: Suppose that the probability measure on $\theta$ conditional on performance puts unit measure on $\theta = 0$. If $\Delta$ can be generated with a canonical no fabrication schedule, then any mechanism generating $\Delta$ at least cost induces fabrication with zero ex ante probability.

Proof: The average incentive cost of a litigation mechanism in this case is given by

$$\frac{c(e, \Delta)}{\Delta} = \int_{\Delta} \frac{c(e(\theta), 0)}{\Delta} q(\theta) = \int_{\Delta} \frac{c(e(\theta), 0)}{\Delta} + \left( 1 - F(\Delta) \right) \int_{\Delta} \frac{d(e(\theta), 0)}{\Delta} \frac{c(e(\theta, \theta))}{\theta} \cdot$$ (12)

From Lemma 1(2) ($t(\theta) \geq 0$) and Proposition 1 this can be no lower than

$$0 + \left( 1 - F(\Delta) \right) \int_{\Delta} \frac{d(e(\theta), 0)}{\Delta} \frac{c_{\theta}}{c_{\theta^*}}.$$

Moreover, each addend in (13) is a lower bound for its respective addend in (12). A canonical no-fabrication schedule generating $\Delta$ achieves the overall lower bound (13). But a schedule that induces fabrication with positive measure cannot. Either $e(0) > 0$, in which case the first addend in (12) strictly exceeds 0, or $e(\theta) > \theta$ on some set of positive $q$-measure, in which case, as remarked in the text, $c(e(\theta), \theta) / t(\theta) > c_{\theta^*} / c_{\theta}$ on a set of positive $q$-measure and the second addend in (12) exceeds its bound in (13). QED
References


Figure 1
\[ \theta = \theta_{TC} = \theta + 45^\circ \]

\[ I = c_r \bar{\theta} + c_f (\bar{e} - \bar{\theta}) \]

\[ I = c_r \bar{e} \]

\[ \bar{e} \]