ISSN 1045-6333

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Discussion Paper No. 116

10/92

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The Program in Law and Economics is supported by a grant from the John M. Olin Foundation.

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Abstract

Assessment of damages is a principal issue in litigation and, in light of this, we consider the social justification for, and the private benefits of, accurate measurement of harm. Greater accuracy induces parties to exercise levels of precaution that better reflect the magnitude of the harm they are likely to generate and, related, it stimulates uninformed parties to learn about risks before acting. However, accuracy in assessment of harm cannot influence the behavior of parties -- and is therefore of no social value -- to the degree that parties lack knowledge of the harm they might cause when deciding on their precautions. In addition, regardless of the social value of accuracy, litigants generally gain by devoting resources toward proof of damages, leading to socially excessive private incentives to establish damages.

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*Both authors are Professors at Harvard Law School and Research Associates at the National Bureau of Economic Research. We are grateful to participants in seminars at Harvard and New York University Law Schools for helpful comments and for research funds from the Harvard Law School Program in Law and Economics, which is supported by a grant from the John M. Olin Foundation. Shavell also acknowledges aid from the National Science Foundation (grant no. SES-911-1947).

1. Introduction

Assessment of damages is often a principal issue in litigation, as the primary objective of the plaintiff is usually to collect as much as possible and that of the defendant to pay as little as possible. Accordingly, parties frequently devote substantial time and effort attempting to establish the level of harm. In light of this, the question naturally arises concerning the underlying social purpose of accurate determination of harm. Our object here is to address this question and to compare socially desirable effort to ascertain harm with what parties wish to expend on the task. To this end, we consider a version of the now standard model of liability for harm[1] in Section 2 of the article, and develop the following four points.[2]

The first is that, other things being equal, *accuracy in the assessment of harm leads parties to act in a way that reflects the magnitude of the harm they might cause* -- to take greater precautions the greater the harm they are likely to bring about. If a company knows that any harm it creates will be accurately

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[1]See, for example, Brown [1973], Landes and Posner [1987], and Shavell [1987].

[2]As will be seen, the emphasis in this article is on the points that assessment of damages is not socially worthwhile if parties do not know the magnitude of harm when they act, and that, despite this, parties may have strong incentives to spend to determine damages in court. These points have not been developed elsewhere to our knowledge, although Kaplow [1991] deals with closely related issues in analyzing which variables courts optimally ought to include in legal rules. There are, however, a number of articles on legal error concerning issues different from those addressed in this article, including Craswell and Calfee [1986] (on mistake in assessing negligence); Kaplow and Shavell [1992b], Png [1986], Polinsky and Shavell [1989], and Rubinfeld and Sappington [1987] (all on mistake in determining who committed a punishable act); and Posner [1973] (a general discussion of accuracy).

determined, then when it is in a situation where it might cause a large harm, it will be motivated to take significant precautions, and when it is in a situation where it might cause only a small harm, it will be led to exercise only modest precautions. Such outcomes are socially desirable because expenditures on precautions are socially worthwhile to the extent that they reduce expected harm. This fundamental and familiar point is the social justification for accurate assessment of damages in the model.[3]

The second point is, in a sense, a corollary of the first: *accuracy in assessment of harm cannot influence the behavior of parties -- and is therefore of no social value -- to the degree that they lack knowledge of the level of harm they might cause when they make their decisions.* Suppose that when considering its level of precautions, a company does not know the specific level of harm that would come about in an accident. (The owner of a supertanker, for instance, is unlikely to be able to predict well the harm an oil spill would cause because that depends so much on circumstance.[4]) All that the company knows is the distribution of possible harms, say $100,000, $500,000, or $900,000, each with equal probability. In such a case, if harm is accurately determined, the company will view an accident as

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[3]Another possible justification for accuracy is that it assures victims compensation. We note this issue in Section 3, but it does not enter in the model, as parties in the model are assumed to be risk-neutral.

[4]The harm due to an oil spill would be determined by such factors as the location of the spill, weather conditions (windy, when oil slicks spread rapidly, versus calm, when they do not), and the quantity of oil that escapes.

causing it an average liability of $500,000 (the average of $100,000, $500,000, and $900,000). But the company will view its potential liability as equivalent, and thus behave identically, if no effort would be made to ascertain actual harm and liability would be set equal to the average harm of $500,000. The general point this illustrates is that there is no effect on behavior, and thus no social value, in measuring harm with greater accuracy than that with which parties can appraise it at the time they decide on their actions.[5]

The third point concerns an indirect benefit of accuracy in assessing harm, namely, that it may *spur parties to learn more before they act about the harm they might do.* If the company knows that any harm it causes will be accurately determined, it will have a motive to learn in advance the magnitude of possible harm, for then it can benefit by altering its level of precautions. If, for instance, it learns that harm and its damages would be $900,000, it will want to exercise higher precautions than otherwise. (By contrast, the company will have no motive to learn about the level of harm in advance if damages will be based upon average harm, and thus its particular level of harm will not affect its damage payments.) That parties have an incentive to learn about harm before they act is socially

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[5]Thus, suppose the company just mentioned had better knowledge than as described, say it knew the loss from an accident would be uniformly distributed between the bounds $450,000 and $550,000. Then it would not be socially worthwhile for the court to determine the precise level of damages within the range -- for this would be to acquire information beyond the knowledge of the company when it acted -- but it would be socially worthwhile for the court to ascertain that damages fell within the range rather than outside -- for that degree of knowledge was possessed by the company when it acted.

beneficial because it is desirable for the level of precautions to reflect the magnitude of the potential harm.

The last point is that parties' incentives to provide information about harm to courts tends to be socially excessive; that is, *parties may well want to demonstrate the level of harm to courts even though this has no, or only limited, social value.* For when an accident occurs, parties will have very definite reasons to prove to courts the level of harm. In particular, defendants will want to establish the true level of harm if it is less than estimated harm, and plaintiffs will want to demonstrate the true harm if it exceeds the estimated level.[6] Further, this is the case independently of whether defendants know the level of harm when they act, which is to say, independently of whether accuracy in determining harm affects behavior and hence has social value.

After analyzing these points in the model, we discuss briefly in Section 3 the generality of our conclusions, the importance of risk aversion and insurance, and the significance of parties' socially excessive incentives to demonstrate the level of harm to courts.

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[6]Suppose the company would be liable for $500,000 in the absence of evidence about the true level of harm. If the true level of harm is $100,000, the defendant would want to establish this rather than pay $500,000; and if the true level of harm is $900,000, the plaintiff would want to establish this rather than receive $500,000.

2. Analysis

Assume that risk-neutral parties choose levels of precaution to reduce the risk of accidents. The harm that a party would cause in an accident varies among them but each would cause one particular level of harm if involved in an accident. Specifically, define

x = cost of precautions to prevent accidents;

$p(x)$ = probability of an accident given x; $p'(x) < 0$; $p''(x) > 0$;

h = harm if an accident occurs;

$f(h)$ = probability density of h.

Also, assume that if an accident occurs, the party who caused it will be held strictly liable[7] and will be required to pay damages;[8] let

d = damages paid if a party causes harm.

We will describe later how d is determined. Assume also that there is a cost to a party of presenting information about harm to courts,[9] where

k = cost of establishing h to courts.

In addition, in one version of the model, we will assume that

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[7]The assumption that liability is strict is not essential; see Section 3.

[8]We do not take into account the possibility of settlement, but were we to do so, the amount paid by the defendant would reflect d (and to induce a favorable settlement, he would spend some amount in negotiations that would reflect k, to be discussed), so that the conclusions we reach would be essentially unchanged.

[9]The assumption that k is borne by parties rather than by courts is inessential; if k is borne by courts and damages are raised by k from the level we say below is optimal, our conclusions remain valid.

there is a cost to a party of obtaining information about harm before he chooses precautions; let

c = cost of obtaining information about h ex ante, before x is chosen.

Social costs exclusive of the expense of obtaining or presenting information are

$$(1) \quad \int_0^\infty [x(h) + p(x(h))h]f(h)dh,$$

where x(h) denotes the precautions taken by parties who would cause losses of h. The social goal is to minimize the sum of (1) and any relevant expenses of obtaining and presenting information. Let x*(h) denote the x that minimizes x + p(x)h.

2.1 Basic Case. We will assume here first that parties do not know h ex ante and then that they do. In each case, we will consider both the situation where courts do not observe h and that where they do, involving the cost k.

Parties do not know harm ex ante. If courts do not observe h, then a single level of damages d applies to all parties, and each party chooses x to minimize

$$(2) \quad x + p(x)d,$$

so all choose x*(d). Social costs are given by

$$(3) \quad \int_0^\infty [x^*(d) + p(x^*(d))h]f(h)dh = x^*(d) + p(x^*(d))\bar{h},$$

where $\bar{h}$ is the expected value of h. As (3) is minimized when d = $\bar{h}$, $\bar{h}$ is the optimal level of damages and social costs are

(4) $x^*(\bar{h}) + p(x^*(\bar{h}))\bar{h}$.

If courts observe h and d = h (which will be shown to be an optimum), then since parties do not know what h will be, they will choose x to minimize

$$(5) \quad x + p(x)\int_0^\infty (h + k)f(h)dh = x + p(x)(\bar{h} + k),$$

so they will choose $x^*(\bar{h} + k)$ and social costs will be

(6) $x^*(\bar{h} + k) + p(x^*(\bar{h} + k))(\bar{h} + k)$.

It follows also that d = h must be an optimum, for when parties do not know h ex ante and thus all choose the same x, (5) gives social costs, which are minimized when x is $x^*(\bar{h} + k)$.[10] Because (6) exceeds (4) for any positive k, we have established

Proposition 1. If parties do not know harm h ex ante, then it is not socially desirable for h to be observed by courts; damages should be set equal to $\bar{h}$, expected harm.

The reason for this conclusion is that if parties do not know h ex ante, their behavior cannot be affected by the fact that their damage payments will depend on h. And since social resources must be expended for damage payments to depend on h, this cannot be desirable.

Parties know harm ex ante. In this case, if courts do not observe h, then parties will behave as they did in the previous case, so optimal damages will again be $\bar{h}$ and (4) will again give social costs.

If courts observe h and d = h (which will be shown to be

[10]Of course, d = $\bar{h}$ for all h is also an optimum.

optimal), then a party of type h minimizes

(7) $x + p(x)(h + k)$,

since he will pay damages of h and bear costs of k if there is an accident. Hence, he will select $x^*(h + k)$. Since this choice of x is optimal given the assumption that h is observed, it is optimal for damages to equal h. Social costs in this situation are

$$(8) \int_0^\infty [x^*(h + k) + p(x^*(h + k))(h + k)]f(h)dh.$$

The difference in social costs between the situations where h is not observed and when it is observed is (4) minus (8):

$$(9) \quad x^*(\bar{h}) + p(x^*(\bar{h}))\bar{h} - \int_0^\infty [x^*(h + k) + p(x^*(h + k))(h + k)]f(h)dh.$$

When k = 0, (9) equals

$$(10) \quad \int_0^\infty \{[x^*(\bar{h}) + p(x^*(\bar{h}))h] - [x^*(h) + p(x^*(h))h]\}f(h)dh,$$

which is positive because for every h other than $\bar{h}$, $x^*(h)$ differs from $x^*(\bar{h})$ -- the optimal level of precaution exceeds (is less than) $x^*(\bar{h})$ when h exceeds (is less than) $\bar{h}$. In addition, it is clear that (9) is decreasing in k, since as k increases, (8) rises; also, (9) is negative for all k sufficiently large.[11] It follows that there is a critical $k^* > 0$ such that $k < k^*$ implies that it is socially desirable to observe h, and such that $k > k^*$

[11] If $k \geq \bar{h}$, then the integrand in (9) exceeds $x^*(\bar{h}) + p(x^*(\bar{h}))\bar{h}$ for all positive h, so (9) must be negative for such k.

implies that it is not socially worthwhile to observe h.[12] We can summarize as follows.

Proposition 2. If parties know harm h ex ante, then it is socially desirable for h to be observed by courts -- and for damages to equal h -- if and only if the cost k of observing h is sufficiently low.

The explanation for this result is of course that when parties know h ex ante and their damage payments depend on h, they will, desirably, choose their level of precautions in accord with h. Hence, if it is not too costly for h to be observed by courts, that will be socially worthwhile.

2.2 Endogenous Acquisition of Information Ex Ante. Suppose now that parties choose whether to acquire information ex ante by making an expenditure: initially, they do not know h, but if they spend c, they learn h. If damages are based on h, assume too, as before, that parties must spend k to establish h to courts. Social costs now include any expenditures made in learning h ex ante. We ask when it is desirable for courts to require parties to establish h.

If courts do not observe h, then d will not depend on h, so that it is obvious that parties will not acquire information about h ex ante. Hence, it is optimal for d to equal $\bar{h}$, parties will choose $x^*(\bar{h})$, and social costs will be given by (4).

If courts observe h and d = h, then if parties acquire

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[12]Of course, when $k = k^*$, it does not matter whether or not h is observed; for simplicity, we will not comment here (or elsewhere) on cases of indifference.

information ex ante, their costs will be

$$(11)\quad c + \int_0^{\infty} [x^*(h + k) + p(x^*(h + k))(h + k)]f(h)dh.$$

Note also that if parties acquire information, d = h must be optimal, since (11) minimizes social costs given that parties learn h. If parties do not learn h, they will minimize $x + p(x)(\bar{h} + k)$ and thus bear costs given by (6). Hence, individuals will acquire information about h when (11) is less than (6), or

$$(12)\quad c \leq [x^*(\bar{h} + k) + p(x^*(\bar{h} + k))(\bar{h} + k)] - \int_0^{\infty} [x^*(h + k) + p(x^*(h + k))(h + k)]f(h)dh.$$

Note that the right side of (12) is positive since $x^*(h + k)$ minimizes $x + p(x)(h + k)$.

Let us now show that it is socially desirable for courts to observe h if and only if (4) exceeds (11), that is, if and only if

$$(13)\quad x^*(\bar{h}) + p(x^*(\bar{h}))\bar{h} - \{c + \int_0^{\infty} [x^*(h + k) + p(x^*(h + k))(h + k)]f(h)dh\} > 0.$$

If (13) holds, then it is socially desirable for h to be observed provided that parties will be led to acquire information ex ante, for then (11) applies. But since $x^*(\bar{h}) + p(x^*(\bar{h}))\bar{h} < x^*(\bar{h} + k) + p(x^*(\bar{h} + k))(\bar{h} + k)$, (13) implies that (12) is satisfied, so that parties will indeed acquire information ex ante. If (13) does not hold, then it cannot be optimal for h to be observed; for if h is observed, social costs either equal (11), which exceeds (4),

or equal (6), which exceeds (4). Also, we note that (13) will hold if c and k are sufficiently low.[13] We therefore have

Proposition 3. Suppose that parties can learn about harm ex ante by making an expenditure c. Then it is socially optimal for courts to observe h if and only if (13) holds; and (13) will hold if c and k are sufficiently low. Further, if it is optimal for courts to observe h, damages equal h, and parties are induced to learn about h ex ante. If it is not optimal for courts to observe h, damages equal $\bar{h}$ and parties are not led to learn about h ex ante.

The rationale behind this result is that for it to be optimal for courts to observe h, it must be that parties' behavior is affected, and for this to be true, it must be that parties are led to learn about h ex ante.[14]

2.3 Endogenous Reporting of Information Ex Post. Suppose that after an accident, parties know h and can elect whether to establish this at cost k; as before, we consider only defendant parties.[15] (To this point, we had assumed that parties do not

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[13]Specifically, we know from before that for any $k < k^*$, (9) is positive; hence, for any $k < k^*$, there is a $c^*(k)$ such that (13) is positive if and only if $c \leq c^*(k)$.

[14]The result here that accuracy leads parties to obtain information about risk and is thus good may be contrasted with a quite different effect of accuracy under assumptions different from ours. Suppose that in the absence of accuracy in assessing harm, parties would expend effort attempting to predict the errors courts would make (even though the parties know the true harm they would cause). Then accuracy would be advantageous because it would discourage parties from investing effort to predict courts' errors. On this general issue, see Kaplow and Shavell [1992a].

[15]These are the simplest assumptions capturing the ability of parties whether to present information to courts; a more detailed model would consider the role of plaintiffs, and discovery by plaintiffs and defendants of each others' information.

elect whether or not to establish k; rather, courts decided whether or not parties spend k to establish h.) If parties establish h, assume that damages will be h, whereas if parties do not establish h, damages will be $\hat{h}$, expected harm conditional on a party not establishing h.[16] (This is a natural assumption to make about damages, but we shall comment below on optimal damages.) Let us reconsider the two cases in the basic model, where parties do not know h ex ante and where they do.

Parties do not know harm ex ante. In this case, as we know from Proposition 1, it is not socially optimal for h to be established and used by courts, for this cannot affect behavior since people do not know h ex ante. However, parties may nevertheless decide to establish h to courts. If a party who has caused harm h establishes this, his costs will be h + k. If he does not demonstrate h, his costs will be $d = \hat{h}$. Hence, parties will establish h if and only if[17]

(14) $h < d - k$.

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[16]As will be discussed, parties will decide to be silent about h if $h \geq d - k$, so that from the definition of $\hat{h}$, we have

$$(*) \quad d = \int_{d-k}^{\infty} hf(h)dh/(1 - F(d - k)) > \bar{h}.$$

It is readily shown that this equation has a solution. By L'Hospital's Rule,

$$\lim_{d\to\infty} \int_{d-k}^{\infty} hf(h)dh/(1 - F(d - k)) = \lim_{d\to\infty} -(d - k)f(d - k)/-f(d - k) = d - k.$$

Thus, as $d\to\infty$, d must exceed the right side of the equation. But at $d = 0$, the right side is positive. Since the right side is continuous in d, there is a d satisfying the equation and it is clear that this exceeds $\bar{h}$.

[17]Were we considering plaintiffs as well as defendants, plaintiffs would decide to establish h if and only if $h - k > d$, or $h > d + k$. Hence, h would be proved to courts unless $|h - d| \leq k$.

Since some parties spend k to establish h, the outcome is not socially optimal; the expenditures on demonstrating h are a social waste.[18] We have thus shown

Proposition 4. Suppose that parties can choose whether or not to establish harm h to courts but that parties do not know h ex ante. Then although it is not optimal for any parties to devote effort to demonstrate h to courts, those for whom $h < d - k$ will do so.

The reason for this result is that parties for whom harm would be sufficiently smaller than damages owed by those who are silent will want to demonstrate harm to lower their damage payments. This motive exists quite independently of the fact that the courts' learning about h is not socially worthwhile since it cannot affect parties' precautions.

It follows that a tax eliminating the incentive to reveal information is efficient. Alternatively, social welfare could be raised if damages are not determined as we assumed. In particular, the state can trivially achieve the optimal outcome by setting d equal to $\bar{h}$ for both silent parties and those who reveal h, for then no one will reveal their h and all will choose $x^*(\bar{h})$,

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[18]The expenditures are $kF(d - k)p(x)$, where x is chosen by parties to minimize

$$x + p(x)\left[\int_0^{d-k} (h + k)f(h)dh + d(1 - F(d - k))\right].$$

Note too that since the term in brackets exceeds $\bar{h}$ (by $kF(d - k)$), the chosen x exceeds $x^*(\bar{h})$.

which is optimal as they do not know h ex ante.[19]

Parties know harm ex ante. In this case, since parties know h ex ante, they anticipate whether they will demonstrate h if they cause harm. If $h < d - k$, a party will want to establish h, so he will choose x to minimize $x + p(x)(h + k)$ and will select $x^*(h + k)$; otherwise, a party will not reveal h, so he will choose $x^*(d)$. It can be shown that parties have an excessive incentive to demonstrate h in the sense that social welfare can be raised by imposing a tax t on revealing h -- in which case a party will reveal h only when $h < d - (k + t)$ rather than whenever $h < d - k$. In this case, $d = \hat{h}$ is implicitly a function of t; we can show that $d'(t)$, the derivative of d with respect to t, is negative because, other things being equal, when t rises, parties with lower h join the group of silent, reducing the conditional mean of h for that group.[20] Social cost as a function of the

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[19]It can also be shown that if we maintain the assumption that $d = h$ for a party who establishes h, social welfare can be raised by lowering d for the silent below $\bar{h}$ (which is below $\hat{h}$), for this reduces the incentive of parties to reveal h, even though it also disadvantageously lowers the care taken by the silent.

[20]When there is a tax, d is determined by

$$(**) \quad d = \int_{d-k-t}^{\infty} hf(h)dh/(1 - F(d - k - t)),$$

since d is the conditional mean of h among those who are silent. Implicit differentiation of this equation with respect to t yields $d'(t) = -(k + t)f/[(1 - F) - (k + t)f]$ (for convenience, the arguments of f and F are omitted here and below in this footnote). Since the right side of (**) is positive at $d = 0$ (it equals $\bar{h}$), we know that at the d that solves (**), the graph of the right side of (**) cuts the line $y = d$ from above, meaning that the derivative of the right side with respect to d is less than 1. This in turn implies (after some substitution, making use of (**)), that $-(k + t)f/(1 - F) < 1$. This inequality means that the denominator of $d'(t)$ is positive, so that $d'(t) < 0$, as claimed. (If the solution to (**) is not unique, we must restrict attention to equilibria d such that the graph of the right side cuts the line $y = d$ from above; such equilibria have a standard stability interpretation.)

tax is

$$(15)\quad \int_0^{d-k-t} [x^*(h + k + t) + p(x^*(h + k + t)(h + k)]f(h)dh$$

$$+ \int_{d-k-t}^{\infty} [x^*(d) + p(x^*(d))h]f(h)dh.$$

The derivative of (15) with respect to t is[21]

$$(16)\quad \int_0^{d-k-t} [x^{*\prime}(h + k + t) + p'(x^*(h + k + t)(h + k)]f(h)dh$$

$$+ (d'(t) - 1)kp(x^*(d))f(d - k - t).$$

The integral is associated with the change in precautions due to an increase in t of individuals who will reveal their h at a private cost of k + t; it is negative for $t < 0$ and is zero at $t = 0$.[22] The second term is negative (recall that $d'(t)$ is negative) and represents the savings in social costs of k per person who is just induced to be silent by an increase in the tax. Accordingly, the condition that expression (16) is 0 can only be satisfied at $t > 0$; the optimal tax is positive. We have thus

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[21]There is also a third term,

$$d'(t)\int_{d-k-t}^{\infty} [x^{*\prime}(d) + p'(x^*(d))x^{*\prime}(d)h]f(h)dh$$

$$= d'(t)x^{*\prime}(d)[1 - F(d - k - t)][1 + p'(x^*(d))d].$$

But since $x^*(d)$ minimizes $x + p(x)d$, we know that $1 + p'(x^*(d))d$ is zero, so that the third term is zero. The explanation is that the silent parties are induced to choose a common level of care $x^*(d)$ to minimize total social costs in their group; thus a change in their common level of care has a zero first-order effect on social costs in their group.

[22]Observe that $x + p(x)(h + k)$ is minimized when x is $x^*(h + k)$ and that $1 + p'(x)(h + k)$ is negative for $x < x^*(h + k)$ and zero when $x = x^*(h + k)$. This implies that the integrand in (16) is negative when $t < 0$ (for then $x^*(h + k + t) < x^*(h + k)$) and is zero when $t = 0$ (for then $x^*(h + k + t) = x^*(h + k)$). Thus the integral is negative when t is negative and zero when $t = 0$.

shown

Proposition 5. Suppose that parties can choose whether or not to establish harm h to courts and that parties know h ex ante. Then parties for whom $h < d - k$ will devote effort to demonstrate h to courts and others will not. Parties' incentives to establish h to courts are excessive.

Note that the proposition states that the incentive to demonstrate h is excessive even though any party who does so anticipates that and will therefore choose x in accord with the loss he might cause. The intuition behind the result is that those parties who are just at the margin between revealing h and not revealing h can be induced by a tax not to reveal h. This is beneficial, since it saves society the social cost k of their revealing k but does not affect their level of precautions. And the disadvantage this creates, that those who will continue to reveal h will, on account of the tax, take slightly greater care, is of no first-order effect when the tax is zero.

An implication of the proposition is that since a positive tax is not just beneficial, but optimal among all possible taxes, any negative tax is suboptimal. This means that a requirement for parties to reveal h must be suboptimal (as it corresponds to payment of a negative tax, a subsidy, for revealing h).

Another point to observe is that the state can achieve a better result if it adjusts damages. In particular, it can be proved (we omit details) that the optimal schedule of damages has the following form: a person whose h is less than an h* (which is

set below $\hat{h} - k$) and reveals h pays h in damages; others pay $\hat{h}$ (regardless of whether they reveal h), where $\hat{h}$ is the conditional mean of h above h*. Here h* is chosen optimally by the state. Note that under this regime, a person whose h is below $\hat{h}$ cannot simply reveal h and pay only h; it is necessary that his h also be below h*. Hence, the state can induce parties to keep silent merely by choosing a low h*; the state does not have to use a tax, which distorts behavior of all who reveal their h, in order to discourage revelation of h. Moreover, under this regime, all who reveal their h choose $x^*(h + k)$, which is optimal given the cost k of revelation and those who are silent take the best uniform level of care, $x^*(\hat{h})$.

3. Extensions and Discussion

(a) *Generality of conclusions.* On reflection, it can be seen that our main conclusions apply more generally than to assessments of harm in accidents. Consider the conclusion that it is not socially desirable for resources to be spent informing courts of the magnitude of harm to the degree that it was unknown to parties when they made their decisions. This conclusion is true also of any elements other than harm (such as facts about causation) unknown to parties when they made their decisions, and under any legal rule in any area of law (for instance the negligence rule, or a rule of contract damages). The reason is that making liability depend on elements not known to parties when

they choose their actions cannot affect their behavior.[23] Similarly, the other conclusions, about the effect of considering a factor in liability on parties' incentives to learn about the factor ex ante, and about parties' excessive incentives to present information to courts about such a factor ex post, also hold more generally.

(b) *Risk aversion and insurance.* Defendants' risk aversion is a factor disfavoring accuracy in the determination of harm, for a risk-averse defendant would prefer damages to be based on average harm than to bear the risk of actual harm. Conversely, plaintiffs' risk aversion favors accuracy in determination of harm, since this assures compensation equal to losses.[24] The availability of liability and first-party insurance, however, qualifies these points, for insurance coverage protects parties

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[23]To be precise, assume that $u(x)$ is the utility of a party as a function of his action x, that $p(x, z)$ is the probability of harm as a function of x and a variable z unknown to him when he chooses x, where $f(z)$ is the probability distribution of z, and that $h(x, z)$ is harm given an accident. Suppose that damages d under a legal rule depend on h, x, and z, requiring in particular that z be observed. Then a party will choose x to maximize

$$u(x) - \int p(x, z)d(h(x, z), x, z)f(z)dz.$$

But if instead damages do not depend on z or h, but rather are defined by

$$d(x) = \int p(x, z)d(h(x, z), x, z)f(z)dz / \int p(x, z)f(z)dz,$$

then the party will behave the same way: he will maximize

$$u(x) - \int p(x, z)d(x)f(z)dz = u(x) - d(x)\int p(x, z)f(z)dz$$
$$= u(x) - \int p(x, z)d(h(x, z), x, z)f(z)dz.$$

Hence, we can construct a damage measure not depending on z under which the party behaves identically, so this must be better, as it does not require courts to observe z.

[24]These statements apply if harm is monetary. If a component of harm (such as pain and suffering) is not monetary and does not affect marginal utility of wealth, then risk averse plaintiffs as well as defendants will prefer damages for that component to be based on average harm.

against risk.

It should also be noted that ownership of liability insurance reinforces our point that accurate assessment of harm may not much affect incentives. This is because the level of damages that are imposed in the particular instance will often matter little to a covered party, since his liability insurer will pay most or all of a court award.

(c) *Importance of the possibility of excessive private incentives to establish harm in adjudication.* The conclusion that private incentives to establish harm accurately in adjudication are excessive seems to us to be of substantial practical importance because parties often lack significant knowledge of risk in deciding on their actions. An individual driving a car is unlikely to be able to predict who he would injure in a collision (a bricklayer or a doctor) or the extent of the harm (whiplash, broken bones, or death). Frequently, a potential injurer will possess only rough actuarial knowledge of risk when choosing his level of precautions. Moreover, it is self-evident that parties are motivated to devote great effort to develop estimates of harm in the course of litigation, for a party will be willing to spend as much as $.99 for every $1 of damages that he can alter in his favor.

Nonetheless, we do not want to be misinterpreted. Parties do, of course, generally possess information relevant to potential accident losses when making decisions. The owner of a fleet of oil tankers will be aware of the amount of oil carried by his

vessels, the resources at risk from spills near a vessel's ports of call, and the like; this knowledge will influence his prior estimates of losses from spills. Damage estimates produced by the legal system should be accurate enough to reflect such factors; if only general averages were used to compute damages, incentives would not be as sharp as they could be. Further, at modest cost parties may be able to improve information about the harm they would cause. Hence, there clearly are valid reasons for computing harm to some reasonable degree of accuracy.[25] Yet we have shown that even where parties have knowledge of risk when deciding on their actions, they have an excessive incentive to establish harm to courts.

(d) *Implications of the analysis for the law.* To the degree that parties have socially excessive incentives to spend determining harm, it would be efficient for the legal system (and for private regimes of alternative dispute resolution) to limit their efforts. Thus, rules that would curtail the number of witnesses offered on damages, that would restrict expert testimony, and so forth, might be beneficial. In addition, in some areas of litigation, it might be advantageous for courts to abandon individualized calculation of harm and instead to employ a tabular approach to determine damages.

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[25]An additional reason for computing harm accurately is that it may increase the knowledge of third parties who will decide on actions in the future. The significance of this consideration is limited, though, for most cases settle and, in any event, jury verdicts are not readily interpreted. Moreover, if the government wishes to disseminate information about losses, it would be more efficient for that to be done directly rather than through litigation.

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