Mistakes, Negligence and Liability

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ABSTRACT

We show that, when individuals can make mistakes, the negligence rule is a de facto strict liability rule. Potential injurers then buy liability insurance as protection against the risk they will make a mistake. We also show that potential injurers do not choose the socially optimal level of precaution.

Keywords: insurance, torts, strict liability

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1. Introduction

We are all human and we all make mistakes. Most of the time the mistakes are of little consequence, and we go through the day wearing one blue sock and one black sock. But regardless of the precautions we take, there is always the possibility that a mistake can lead to serious harm to others and result in legal liability. In this paper, we examine some of the implications of mistakes for liability law and for markets for liability insurance.

Under the strict liability rule, injurers are responsible for the damages they cause to their victims regardless of the level of care that they take. It is easy to understand why risk averse individuals would buy liability insurance when faced with strict liability. Under a negligence rule, injurers are responsible for the damages they cause only if their level of care does not meet the applicable standard of care. If injurers meet that standard of care, then they avoid liability and victims must bear the full cost of their injuries. Brown (1973) shows that risk neutral agents will meet the negligence standard if it is set optimally. Shavell (1982) proves that this implies risk averse agents will meet the negligence standard and therefore will not purchase liability insurance.

Substantial amounts of money are spent on liability insurance each year by individuals and businesses. In the U.S. during 2007, premiums for medical malpractice insurance were $10.6 billion, premiums for the liability portion of commercial multiple peril insurance were $14.2 billion, and premiums for “other liability” were $53.5 billion.\(^1\) But for the types of liability covered by these policies, knowledge of the standard of care would imply that every

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\(^1\) “Other liability” includes coverages for liability resulting from negligence, carelessness or failure to act. This category includes, among others, professional liability (e.g., lawyers, accountants), directors and officers, errors and omissions and employments practices liability. Data are for direct premiums earned and are from Best's (2008).
potential injurer could simply meet the standard of care and would never be liable. This suggests
that some characteristics of liability law, especially characteristics of the negligence rule, expose
individuals and firms to risks that can be managed more efficiently through insurance.

Shavell (2000, pp. 171-172), reflecting widely held views, argues that liability insurance
is purchased to protect against possible risks arising out of: 1) the uncertain operation of the legal
system; 2) risks due to momentary lapses in care; and 3) risks due to the negligent behavior of
agents. There is a large literature, going back to Craswell and Calfee (1986) and Png (1987),
examining the effects of judicial errors in determining liability. Research by Sarath (1991),
Gutierrez (2003) and Fagart and Fluet (2007) examines the relationship between judicial errors
in applying the negligence rule and purchases of liability insurance. Judicial errors affect the risk
of being found negligent, but do not affect the relationship between the potential injurer's
decisions and the risk of accidents. Mistakes by potential injurers, on the other hand, affect both
the risk of accidents and the risk of being found negligent. To our knowledge, only Diamond
(1974) considers the effect of momentary lapses in care, or mistakes, by potential injurers.
However, Diamond assumes that liability insurance is not available.

The objective of this paper is to determine whether the fact that people make mistakes is
sufficient to create a demand for liability insurance under a negligence rule. We assume that
potential injurers choose the level of precaution that they take, where precaution can be thought
of as the usual or intended level of effort to reduce the risk of harming others. The possibility of
a mistake means that the level of care at a particular moment may deviate from the usual level of
precaution. This is important because, as Shavell (2000, p. 172) puts it "… it is a person's
momentary level of care that is observed by the courts and determines negligence, not his
prudential habits." Thus, the question becomes whether people will buy liability insurance as protection against the risk they will make a mistake.

We assume away other reasons that individuals might buy liability insurance. We assume that potential injurers are homogeneous and that they know the risk of an accident and the potential damages. We assume that the courts work perfectly, that is, the level of care is observed accurately and the courts do not err in determining negligence. We assume that potential injurers choose precautions for themselves. We show that when individuals can make mistakes they always face liability risk and the de jure negligence rule is a de facto strict liability rule. We show that the possibility of mistakes can be sufficient to create a demand for liability insurance under the negligence rule. Unlike the deterministic case, potential injurers do not, in general, choose the socially optimal level of precautions.

2. Mistakes and Liability

The model is the standard model of unilateral accidents between strangers. That is, only the potential injurer can affect the probability that an accident occurs. There is no contractual relationship the potential victim can use to provide incentives to the potential injurer.

Following Diamond (1974), we distinguish between precaution, which is the usual or intended level of effort to avoid injuring others, and care, which deviates randomly from precaution and is measured at the time an accident occurs. We let $x$ denote precaution, and assume $x \geq 0$. Care is then $\tilde{x} = (1 + \tilde{\varepsilon})x$, where $\tilde{\varepsilon}$ is the mistake or random deviation from precaution, and $E\{\tilde{\varepsilon} | x\} = 0$. Care is also nonnegative, $\tilde{x} \geq 0$. In most analyses of liability, the

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2 Bajtelsmit and Thistle (2008, 2009) show that demand for liability insurance can arise if potential injurers are heterogeneous or are not initially informed about their risk exposures.

3 The analysis can be considered a model of negligent behavior of agents if one is willing to treat the principle-agent relationship as a "black box" and assume that the firm is risk averse.
probability of an accident is a function of precaution and is deterministic. We let \( p \) denote the probability of an accident and assume that it is decreasing and convex, \( p' < 0 \) and \( p'' > 0 \). However, we assume that the probability of an accident depends on the level of care, \( \bar{x} \), rather than the level of precaution. Thus, if, as the result of a mistake, the level of care falls, then the risk of an accident increases.

We assume that when an accident occurs the realized value of care is immediately and accurately observed by the injurer, the victim, the insurer and the court.\(^4\) The court is then able to determine whether or not the realized level of care meets the negligence standard or not. Then, once an accident occurs, victims know with certainty whether or not they will win a lawsuit.\(^5\) The victim always sues if they will win and never sues if they will lose. We are agnostic regarding whether precaution is observed or not; the observability of precaution not central to our analysis.

We let \( F(\cdot|\bar{x}) \) represent the distribution function for care, conditional on the level of precaution. Under the negligence rule, we will be interested in \( F(z|\bar{x}) \), where \( z \) is the standard of due care.\(^6\) \( F(z|\bar{x}) \) is then the probability that care falls below the standard and the injurer is

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\(^4\) Since the insurer can observe care after an accident, it is possible to condition the insurance policy on care (even if precaution is not observable). But since care is random, conditioning on care implies the policy is a randomized contract. Proposition 2 of Arnott and Stiglitz (1988) implies that, under our assumptions, randomized contracts are not optimal.

\(^5\) It is tempting to interpret \( \bar{\epsilon} \) as mismeasurement of precaution by the court. However, mismeasurement by the courts does not affect the relationship between precaution and the risk of accidents, so (1) the risk of an accident would be deterministic and (2) there would be no covariance between the risk of an accident and liability under the negligence rule. In addition, this interpretation implies there will be uncertainty whether the court will find the injurer negligent until the court renders a decision. In this case, the victim must make a strategic decision whether or not to litigate based on the expected payoff to the lawsuit, that is, based on how victims form expectations about the injurer's care, on \( F(|\bar{x}) \), and on the cost of litigation. In particular, if litigation is costly, then some victims will not sue. The assumption that care is observed immediately after the accident rules out this possibility. In the analysis here, victims observe the realization of care, know with certainty whether the injurer will be found negligent and sue as long as litigation costs are less than damages.

\(^6\) We do not assume that the negligence standard is set optimally. Shavell (1997) shows that risk neutral individuals will meet a supra-optimal negligence standard so long as the cost of doing so does not exceed the total expected cost of accidents. Bajtelsmit and Thistle (2008) show that risk averse individuals will also meet a supra-optimal negligence standard if the cost of doing so does not exceed the total expected costs of accidents plus a risk premium.
egal, given that they have chosen precaution \( x \). We assume \( F(z|x) > 0 \) for all \( x \), that is, regardless of the level of precaution, it is always possible that a mistake will result in a negligent level of care. We assume that \( \partial F(z|x)/\partial x < 0 \) and \( \partial^2 F(z|x)/\partial^2 x > 0 \), that is, increasing precaution decreases the probability of negligence, but at a decreasing rate.

Potential injurers maximize the expected value of \( u(w) - x \), an event-independent, additively separable von Neumann-Morgenstern utility function over wealth and care. We assume that potential injurers are nonsatiated \( (u' > 0) \) and risk averse \( (u'' < 0) \). Potential injurers have fixed initial wealth \( w \). If an accident occurs, the victim suffers damages \( d < w \). If the injurer is liable, then victims are fully compensated for their damages. Victims are assumed to be risk neutral. An insurance policy consists of a premium, \( \alpha \), paid if no loss occurs and a net indemnity, \( \beta \), received in the event of a loss. A policy provides full coverage if \( \alpha + \beta = d \). We assume that \( \lim_{t \to 0} p'(t) = -\infty \); the marginal return to the first unit of care is arbitrarily large. This implies that potential injurers choose a strictly positive level of precaution if an insurance policy offers less than full coverage.

2.1 \textit{Strict Liability}. The analysis of the strict liability rule is straightforward. Under strict liability, utility is

\[
\tilde{U}(\alpha, \beta, x) = (1 - p(\tilde{x}))u(w - \alpha) + p(\tilde{x})u(w - d + \beta) - x;
\]

this is random because of the possibility of mistakes. Taking the expectation yields

\[
U(\alpha, \beta, x) = (1 - \tilde{p}(x))u(w - \alpha) + \tilde{p}(x)u(w - d + \beta) - x,
\]

where \( \tilde{p}(x) = E[p(\tilde{x})|x] \) is the expected probability of an accident, given precaution \( x \). For the insurance company, profit is

\[
\tilde{\Pi}(\alpha, \beta, x) = (1 - p(\tilde{x}))\alpha - p(\tilde{x})\beta.
\]

Taking the expectation yields
\( \Pi(\alpha, \beta, x) = (1 - \overline{p}(x))\alpha - \overline{p}(x)\beta. \)  

(2.4)

We have \( \overline{p}'(x) < 0 \) and \( \overline{p}''(x) > 0 \), and, because \( p \) is convex, \( \overline{p}(x) > p(x) \). This leads to our first result:

**Proposition 1**: Assume a strict liability rule. The possibility that individuals may make mistakes increases the expected probability of loss but otherwise has no effect.

The results that are valid under a strict liability rule when precaution is deterministic hold when individuals make mistakes.

### 2.2 Negligence

We now turn to the analysis of the negligence regime. In order for an individual to be liable under the negligence rule, the individual must cause harm to another. This occurs with probability \( p(\tilde{x}) \). In order to be liable, the individual's level of care at the time of the accident must also fail to meet the standard of due care, \( \tilde{x} < z \). However, the occurrence of harm and the failure to meet the standard of due care are not independent events. Let \( N(\tilde{x}) = 1 \) if \( \tilde{x} < z \) and \( N(\tilde{x}) = 0 \) if \( \tilde{x} \geq z \) be the indicator variable for negligence. The expected value of \( N(\tilde{x}) \) is \( E\{N(\tilde{x})|x\} = F(z|x) \). The probability that the potential injurer will liable is \( p(\tilde{x})N(\tilde{x}) \), so the potential injurer's utility is

\[
\tilde{U}(\alpha, \beta, x) = (1 - p(\tilde{x})N(\tilde{x}))u(w - \alpha) + p(\tilde{x})N(\tilde{x})u(w - h + \beta) - \tilde{x}. \tag{2.5}
\]

The expected probability that the potential injurer will be liable is

\[
\lambda(x) = E\{p(\tilde{x})N(\tilde{x})|x\} = \overline{p}(x)F(z|x) - \gamma(x), \tag{2.6}
\]

where \( \gamma(x) = \text{cov}\{p(\tilde{x}), N(\tilde{x})|x\} \). Since the probability of an accident and the indicator for negligence are non-increasing functions of care the covariance is positive, \( \gamma(x) > 0 \).

Then expected utility for the potential injurer is

\[
U(\alpha, \beta, x) = (1 - \lambda(x))u(w - \alpha) + \lambda(x)u(w - d + \beta) - x. \tag{2.7}
\]
Expected profit for the insurance company is

$$\Pi(\alpha, \beta, x) = (1 - \lambda(x))\alpha - \lambda(x)\beta.$$  \hfill (2.8)

Expected utility and expected profit are the same as under a strict liability rule where the probability of an accident is \(\lambda(x)\). This yields our next result:

**Proposition 2**: Assume a negligence rule. Then the possibility that individuals may make mistakes implies the negligence rule is a *de facto* strict liability rule.

This implies that results that are valid under a negligence rule when precaution is deterministic do not continue to hold with individuals can make mistakes.

The effect of precaution on the expected probability of liability is \(\lambda'(x) = \bar{p}'(x)F(z|x) + \bar{p}(x)\partial F(z|x)/\partial x - \gamma'(x)\), which is negative if \(\gamma'(x) > 0\). We also have \(\lambda''(x) = \bar{p}''(x)F(z|x) + 2\bar{p}'(x)\partial F(z|x)/\partial x + \bar{p}(x)\partial^2 F(z|x)/\partial x^2 - \gamma''(x)\), which is positive if \(\gamma''(x) < 0\).\(^7\) That is, increasing precaution reduces the probability of liability but at a decreasing rate. In addition, potential injurers will choose a strictly positive level of precaution if the insurance policy offers less than full coverage. Then \(\lambda\), probability of liability, has the properties assumed for \(p\), the probability of an accident, in the standard model of strict liability.

This suggests that the results that are valid under a strict liability rule are valid under the negligence rule where \(\lambda\) replaces \(p\). One result that remains valid is that individuals will be willing to buy liability insurance.

**Proposition 3**: Assume a negligence rule. The possibility that individuals may make mistakes implies that there is a demand for liability insurance.

\(^7\) The assumptions \(\gamma'(x) > 0\) and \(\gamma''(x) < 0\) are sufficient but not necessary conditions for \(\lambda'(x) < 0\) and \(\lambda''(x) > 0\). The assumption \(\gamma'(x) > 0\) reduces to the assumptions \(\partial F(z|x)/\partial x > 0\), that is, precaution becomes less effective in reducing the probability of negligence as the negligence standard increases.
Thus, the fact that individuals make mistakes provides one explanation why there is a market for liability insurance under the negligence rule.

When mistakes are possible, the socially optimal level of care, $x^*$, minimizes the total expected cost of accidents, $x + \bar{p}(x)d$, and satisfies $\bar{p}'(x^*) = -1/d$. Now suppose that precaution is observable and insurance policies are fairly priced. Under the strict liability rule potential injurers choose full coverage and face the premium $\alpha = \bar{p}(x)d$. Then potential injurers are induced to choose the socially optimal level of care. Under the negligence rule, potential injurers also choose full coverage. However, they face the premium $\alpha = \lambda(x)d$, and as a result, they do not choose the socially optimal level of care. If precaution is not observable so there is a moral hazard problem, then potential injurers do not choose the socially optimal level of care under either strict liability or negligence.

**Proposition 4**: Assume a negligence rule. Then the possibility that individuals may make mistakes implies that potential injurers do not choose the socially optimal level of precaution.

Under the negligence rule, potential injurers do not fully internalize the risk of harm to others since they have a positive probability of avoiding liability. As a consequence, they do not choose the socially optimal level of precaution. When precaution is observable, the strict liability rule does not lead to a distortion in intended precaution, which is an argument for the use of the strict liability rule.

In the deterministic case where potential injurers do not make mistakes, potential injurers just meet the (optimally set) standard of care and do not buy liability insurance (Shavell, 1982. Proposition 5). This raises the question of whether there are any circumstances under which this conclusion holds when individuals do make mistakes. The answer, as we now show, is no. From Proposition 3, potential injurers buy liability insurance against the risk of a mistake that
leads to care falling below the negligence standard. In order for potential injurers to not purchase liability insurance, they must be able to completely avoid being negligent. But if \( F(z|x) > 0 \) for all \( x \), this is not possible. Suppose instead that the distribution of care and the standard of care are such that there is an \( \hat{x} \) for which \( F(z|\hat{x}) = 0 \). While \( z \) is the \textit{de jure} standard of care, \( \hat{x} \) is the \textit{de facto} standard of care. Observe that we must have \( \hat{x} > z \), or equivalently, that \( F(z|z) > 0 \). If potential injurers choose precaution \( \hat{x} \) and do not buy insurance, then the level of precaution exceeds the negligence standard. Alternatively, if potential injurers choose the level of precaution \( z \) and meet the standard of care, then they are exposed to liability risk and will buy insurance.

3. Conclusion

In this paper we examine the effect of mistakes by potential injurers on tort law and on the demand for insurance. We show that mistakes increase the expected probability of loss under strict liability, but otherwise have no effect. We show that, when individuals can make mistakes, the negligence rule is a \textit{de facto} strict liability rule. Potential injurers then buy liability insurance as protection against the risk they will make a mistake. We also show that potential injurers do not choose the socially optimal level of precaution.
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