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Efficient Standards of Due Care: Should Courts Find More Parties Negligent Under Comparative Negligence?

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Abstract

We show that negligence standards should differ under comparative and contributory negligence regimes. If due care standards are allowed to vary with the laws of a jurisdiction, then comparative and contributory negligence may be equally efficient, even in a model with evidentiary uncertainty. It is commonly observed that jurors are naturally inclined to be more lenient to plaintiffs on the issue of plaintiff negligence in contributory negligence jurisdictions. We show that such lenience may actually be efficient in addition to satisfying jurors' senses of equity. A similar conclusion applies to defendants.

1. Introduction

Jurors are apt to be more sympathetic to plaintiffs in contributory than in comparative negligence jurisdictions.[1] To see why, consider cases where the plaintiff is only slightly at fault. Jurors may perceive it as an excessively harsh result, that the plaintiff is completely barred from recovery by a successful contributory negligence defense. And, the process of determining whether the plaintiff did breach her duty of care is riddled with vagaries. Consequently, jurors' may fudge when they decide whether the plaintiff was contributorily negligent. Such leniency is generally perceived, by jurors and commentators alike, as promoting equity.

What is not generally understood is that leniency to the plaintiff in the determination of contributory negligence may also be instrumental for promoting efficient care-taking. Our model explains this possibility. Surprisingly, we find that an efficient switch from contributory to comparative negligence requires implementing stricter standards of due care for both plaintiffs and defendants. These results might be taken as a prescription for reforming jury negligence instructions; however, we suggest in the conclusion that the results are less a prescription for reform, than a vindication of the status quo.

Choosing a standard of due care in conjunction with a damage apportionment rule is critical for the efficiency of a liability system. In fact, economic theories which find that comparative negligence is superior to contributory negligence, or vice versa, are typically artifacts of their assumptions about the standard of care. For instance, in contexts where courts could observe levels of care, Brown (1973), Orr (1991), Posner (1977), and Landes and Posner (1980)[2] present models in which comparative negligence, contributory negligence, or both, are inefficient. In all these models, however, such inefficiencies can only arise because the standard of care that parties must meet differs from the level of care

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[1] See Wittman (1986) for some support of this viewpoint.

[2] Landes and Posner (1980) get inefficiency in what they call the "alternative" care case (see footnote 4 below).

that is socially efficient.[3] Haddock and Curran (1985), Landes and Posner (1987),[4] and Shavell (1987) have shown that in such full-information models, when the standard of due care is chosen to be the same as the socially efficient level of care, the unique equilibrium involves all parties taking efficient care (see also Chung's (1993) comment on Orr (1991)).[5]

Cooter and Ulen (1986) have asserted, however, that although the legal apportionment rule is irrelevant when juries are well-informed, when juries imperfectly observe parties' precautions, comparative negligence can be more efficient than contributory negligence. The well-established full-information result that both negligence systems are efficient fails in their model because they introduce evidentiary uncertainty. This failure allowed them to rank the systems by their efficiency properties. The added realism of models with evidentiary uncertainty is clearly welcome. However, it should be understood that any potential superiority of comparative negligence depends critically on implicit assumptions about the standards of due care, much as did the inefficiency results cited above. Changing assumptions about the standards of care can change any efficiency result. In contrast to the full-information models, we may not get efficiency if we choose the standard of care equal to the level that would be socially efficient for people to undertake. But, whereas this was exactly the right standard of due care when courts

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[3]This fact together with all these models is discussed in more detail in Edlin (1992).

[4]In the case of "joint" care, Landes and Posner (1980) proved efficiency. I only qualify with "in the case of 'joint' care" because they themselves seem to do so at pp. 537-9. However, their insightful reasoning in footnote 51 is really quite general and would apply equally well to the "alternative" care case which they distinguish (if only the standard of care were set at the optimal levels rather than the levels they use in discussing "alternative" care). NB: in their 1987 book, p. 80-82, they cease to distinguish in this context between "joint" and "alternative" care.

[5]We refer the reader to these articles to understand why the uniqueness of the solution to the social planners' problem guarantees the uniqueness of this equilibrium. However, it is not difficult to understand that meeting the socially optimal standard is *an* equilibrium under any negligence system. Assume that both defendant and plaintiff set care equal to the standard of care, and ask if it pays either to deviate. Under any negligence system, the non-negligent defendant is not at all liable. Since care levels are at the social optimum, the plaintiff's problem is embedded in the social planner's; consequently since varying both care levels would not improve the social planner's maximand, varying only plaintiff care cannot improve her payoffs. If the defendant reduces care at all, he becomes fully liable; thereafter he has a problem that is embedded in the social planner's, so defendant also will not vary care.

observe care, when courts get only a noisy view of actual care, this standard induces the wrong levels of precaution.

One contribution of this paper is to formalize the simple idea that if the standard of due care, instead of being chosen equal to the care we would like people to take, is rather chosen equal to whatever level induces parties to take appropriate levels of care, then there is no theoretical basis to favor either liability system. Both systems can lead to efficient outcomes, just as in models where juries perfectly observe care levels.

In explaining this fact, we present a model of evidentiary uncertainty that allows contributory negligence to be embedded as a special limiting case of comparative negligence. Because of this embedding, we are able to make our second contribution, which is to compare efficient systems of contributory and comparative negligence. We find that in order to induce efficient care-taking, juries must be more lenient to both defendants and plaintiffs in determining negligence in contributory negligence jurisdictions. We also find that in equilibrium, more damages are shifted to defendants on average under an efficient comparative negligence system than under an efficient contributory negligence system.

Speaking somewhat loosely, we can intuitively understand the required leniency in the case of plaintiffs as compensating for the fact that *all else equal*, plaintiffs will be more cautious under contributory negligence than under comparative negligence, because of the extra penalty from being erroneously found to be negligent under contributory negligence.[6] This logic is the crux of the result for the plaintiff's negligence standard. However, we qualified it as "loose intuition," because when the two systems are running efficiently, all else is not equal. In particular, the chance that the defendant is found negligent should differ, because the defendant should have a different duty, or standard, of due care.

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[6]Interestingly, it is this same "extra penalty," that induces juries concerned with equity to be lenient.

It is therefore valuable to be more explicit about why we should be lenient to plaintiffs. Observe that there are two reasons for a risk-neutral plaintiff to increase care expenditures:

> **Incentive #1**: *Decreasing her share of damages.* Increasing care-taking decreases the chance of being found negligent, and hence the plaintiff's share of damages. Reductions in the plaintiff's share of damages must be multiplied by the expected total damages to evaluate the plaintiff's incentive to take care.
>
> **Incentive #2:** *Decreasing total expected damages.* Increased care-taking reduces the chance of or the severity of an accident, and hence the total expected damages. Importantly, marginal reductions in total expected damages must be multiplied by the plaintiff's average share of damages to evaluate this incentive to take care.

We will consider these two incentives to take care, first conditional on a finding of defendant non-negligence, then conditional on defendant negligence.

Conditional on the defendant being found not negligent, the plaintiff has efficient incentives to take care under either comparative or contributory negligence. Under both systems, the plaintiff bears all damages in these circumstances. Taking extra precautions does not change the plaintiff's share of damages, it only reduces expected total damages. And, all reductions in damages are captured by the plaintiff. Thus, for any standards of care, conditional upon a finding that the defendant is not negligent, the plaintiff has socially efficient care-taking incentives under either liability system. Therefore, the important issue in choosing the plaintiff's standard of care is to give the plaintiff efficient care-taking incentives conditional on a finding that the defendant *is* negligent.

Conditional on a finding of defendant negligence, the plaintiff's gain from reducing the chance that she is found negligent is less under comparative negligence than under contributory negligence, because of the total bar to recovery posed by a contributory negligence defense. Thus incentive #1 is smaller under contributory negligence. Therefore, when switching to comparative negligence, in order to compensate the plaintiff, so that she still takes efficient care, incentive #2 must be made larger. Courts must increase the share of damages the plaintiff expects to bear under comparative negligence, again

conditional upon the defendant being found negligent. An increase in the plaintiff's share of damages requires that there be an increased chance that the plaintiff is found negligent (enough of an increase first to overcome the straightforward tendency under comparative negligence for the plaintiff to bear less damages when both are negligent, and second to compensate for the decrease in incentive #1). Thus, to induce efficient care-taking, the standard of due care under comparative negligence must be stricter for the plaintiff than under contributory negligence, so that the plaintiff is more frequently found negligent when taking the efficient level of care.

The defendant has incentives to take care parallel to those for the plaintiff. At first blush, one might expect that the incentive to reduce the chance of being found negligent under comparative negligence would exceed that under contributory negligence. After all, when both are found negligent, under comparative negligence the defendant gains from converting his own negligence finding into a not-negligent finding, whereas under contributory negligence no such gain exists. When the plaintiff is found not negligent, the gains are the same under each system. Thus, if the chance that the plaintiff is negligent were the same in the two systems, the defendant's incentive #1 would be larger under comparative negligence. However, when these two systems function efficiently, the plaintiff should be found negligent much more frequently under comparative negligence. So much more frequently, that the defendant's returns from avoiding negligence determinations should be lower under comparative negligence than under contributory negligence.

Since incentive #1 is smaller under comparative negligence, in order to induce efficient care-taking from the defendant, the defendant must have an increased incentive to lower the expected total damages. Accordingly, the defendant must bear an increased average share of damages. Since we determined above that the plaintiff must bear an increased share of damages *conditional upon the defendant being found negligent*, in

order for the defendant to bear more of the unconditional damages, the defendant must be found negligent more frequently under comparative negligence.

If one believed the legal system evolves toward the efficient rule, then one would predict that standards of care for both plaintiff and defendant would be more lenient under contributory than comparative negligence. Otherwise, one would advocate that the standards should be more lenient. The last section argues that at a qualitative level standards of due care in American law have adjusted appropriately to the widespread shift to comparative negligence.

2. A Model of Evidentiary Uncertainty: Noisy Information.

We now present a simple model of evidentiary uncertainty under two legal regimes, comparative and contributory negligence. Plaintiffs and defendants are distinguishable *ex ante*. When they exercise levels of care of π and δ respectively, expected damages suffered by the plaintiff from the accident are given by $D(\pi,\delta)$. The plaintiff's cost of care function is $C(\pi)$ and the defendant's is $C(\delta)$.[7] Costs of care increase with π and δ, and the expected damages decrease. We assume both functions are differentiable. The social planner's problem is then to choose levels of care π^* and δ^* that solve

(1) [SPP] $\underset{\pi,\delta}{Max} \; - C(\pi) - C(\delta) - D(\pi,\delta).$

To ensure that the objective function is strictly concave, so that first-order conditions are both necessary and sufficient for finding the unique interior optimum, we assume that the cost and damage functions are strictly convex. First-order conditions for an optimum are:

FOC $C_{\pi}(\pi) = -D_{\pi}(\pi,\delta)$ and $C_{\delta}(\delta) = -D_{\delta}(\pi,\delta)$.

Due to evidentiary uncertainty, juries do not know the true levels of care taken. We consider a natural case of Cooter and Ulen's (1986) model, in which when true levels of

[7]Costs of care for whatever type of case is under consideration are assumed to be known, as in the models of Orr (1991), Landes and Posner (1987), Cooter and Ulen (1986), Haddock and Curran (1985), and Shavell (1987). For a relaxation of this assumption (but where there is no evidentiary uncertainty, see Rubinfeld (1987)).

care are π and δ, the jury estimates care levels to be $\pi + u_\pi$ and $\delta + u_\delta$, where errors u_π and u_δ are independently distributed random variables, each drawn uniformly from some interval $[-w,w]$.[8] Without loss of generality, we will assume this interval is $[-\frac{1}{2},\frac{1}{2}]$, which amounts to a renormalization of the care variables π and δ. We write the cumulative distribution function $F(u) \equiv u+1/2$ to represent the chance that u_δ or u_π is drawn below u for any $u \in [-\frac{1}{2},\frac{1}{2}]$.

Plaintiffs and defendants will *not* generally know beforehand whether a jury will find them to be negligent. We assume they do, however, know the distribution of errors, so they can deduce the values given in probability table 1.[9] Let $\bar{\pi}$ and $\bar{\delta}$ be the negligence cutoffs, or standards of due care, for the plaintiff and the defendant respectively. If the plaintiff or the defendant is found to exercise more care than her negligence cutoff, she is found "not negligent."

Table 1: Probabilities of Findings of Negligence by Trier of Fact

		Plaintiff, Π	
		Negligent	Not Negligent
Defendant Δ	Negligent	$F(\bar{\pi}-\pi)F(\bar{\delta}-\delta)$	$[1-F(\bar{\pi}-\pi)]F(\bar{\delta}-\delta)$
	Not Negligent	$F(\bar{\pi}-\pi)[1-F(\bar{\delta}-\delta)]$	$[1-F(\bar{\pi}-\pi)][1-F(\bar{\delta}-\delta)]$

This table gives joint probabilities of findings of fact regarding plaintiff and defendant negligence given standards of care $\bar{\pi}$ and $\bar{\delta}$ and levels of care π and δ.

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[8] Haddock and Curran (1985) model asymmetric information in the same way and achieve similar results to Cooter and Ulen (1986). Both of these models and the one we present are really bilateral care versions of the model of Craswell and Calfee (1986). Rubinfeld (1987), in contrast, takes a quite different approach assuming that the court knows the actual levels of care, but does not know the private costs of care. By theoretical argument and numerical calculation, he concludes that comparative negligence is superior to contributory negligence due to its added flexibility in allowing parties to choose a variety of care levels and experience a variety of payoffs. The work of Haddock and Curran, Cooter and Ulen, and this paper are complementary to Rubinfeld in that they add imperfect information in two different dimensions.

[9] It is possible that each jury may have different abilities to deduce care levels from evidence. The distributions we are considering should represent an appropriate averaging of these. Negligence standards need not be tailored to any particular jury. (Contrast with Haddock and Curran (1985) at p. 66.)

2.1. Contributory Negligence

From the probabilities in Table 1, the parties can determine their expected payoffs. Under contributory negligence, a finding that the plaintiff is negligent is a complete bar to her recovery. The plaintiff will bear the burden of the accident at all times except when she is not negligent and the defendant is negligent. In such cases, the defendant bears all damages. Thus, the plaintiff chooses his care level $\hat{\pi}$ to solve

(2) **[Π]** $\underset{\pi}{Max} \; -C(\pi) - \left(1 - \left[1 - F(\bar{\pi} - \pi)\right] F(\bar{\delta} - \delta)\right) D(\pi, \delta)$.

Conversely, the defendant must pay the plaintiff damages if the defendant is found negligent and the plaintiff is not. The defendant chooses $\hat{\delta}$ to solve

(3) **[Δ]** $\underset{\delta}{Max} \; -C(\delta) - \left(1 - F(\bar{\pi} - \pi)\right) F(\bar{\delta} - \delta) D(\pi, \delta)$.

It should be noted that both the plaintiff's and defendant's objective functions are continuous because the discontinuity that is typical at the negligence cutoff is smoothed by the continuity of the cumulative distribution function. If there were no evidentiary errors, then the cumulative distribution F(u) would be discontinuous at 0 (all weight would be put on u=0, and F(u) would jump from 0 to 1 at u=0). Evidentiary uncertainty makes the plaintiff's and the defendant's maximization problems match our intuition: the choice of care becomes a marginal choice because changes in care do not lead to discontinuous changes in expected payoff.[10] Optimization involves marginal choices, and acting nearly optimally brings nearly maximal payoffs.[11]

2.2. Comparative Negligence

Like Posner (1977), Orr (1991), and Landes and Posner (1980), we consider a simple model of comparative negligence in which when both the plaintiff and defendant are found negligent, the defendant pays a share α of the damages. The model and its

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[10]Technically, to make the choice truly *marginal*, the cumulative distribution F needs to be differentiable in addition to being continuous.

[11]Modeling evidentiary uncertainty adds another realistic aspect to a tort model. Even with rational choices of care, parties will at times be found negligent, so the fact that people are often found negligent in practice does not imply any irrationality. One also need not resort to unobservable heterogeneity.

exposition become needlessly more complex if this is generalized such that α varies.[12]

The plaintiff chooses care level $\hat{\pi}$ to solve

(4) [Π] $\underset{\pi}{Max} \; -C(\pi)-(1-\alpha)F(\bar{\delta}-\delta)F(\bar{\pi}-\pi)D(\pi,\delta)-\left(1-F(\bar{\delta}-\delta)\right)D(\pi,\delta).$

The first term is again the cost of care; the second is the loss resulting from the plaintiff's share of damages when both parties are negligent; and the third is the loss resulting from damages when the defendant is not negligent and the plaintiff must bear all losses. Correspondingly, the defendant will suffer a share of expense when both are negligent and the whole of damages when he alone is. His problem is therefore to choose care level $\hat{\delta}$ to solve:

(5) [Δ] $\underset{\delta}{Max} \; -C(\delta)-\alpha F(\bar{\pi}-\pi)F(\bar{\delta}-\delta)D(\pi,\delta)-[1-F(\bar{\pi}-\pi)]F(\bar{\delta}-\delta)D(\pi,\delta).$

It is easily seen that contributory negligence is embedded in this model, being the special case where α=0.

2.3 Individual Optimization and Equilibrium

First-order necessary conditions for care levels π and δ to be a Nash Equilibrium are found by differentiating the objective functions in [Π] and [Δ] with respect to care levels and setting these derivatives equal to zero:[13]

$$(6)\; C_{\pi}(\pi) = -D_{\pi}(\pi,\delta)\left[(1-\alpha)F(\bar{\delta}-\delta)F(\bar{\pi}-\pi)+1-F(\bar{\delta}-\delta)\right]+(1-\alpha)F(\bar{\delta}-\delta)D(\pi,\delta)$$

$$(7)\; C_{\delta}(\delta) = -D_{\delta}(\pi,\delta)\left[\alpha F(\bar{\delta}-\delta)F(\bar{\pi}-\pi)+[1-F(\bar{\pi}-\pi)]F(\bar{\delta}-\delta)\right]+\left[1+(\alpha-1)F(\bar{\pi}-\pi)\right]D(\pi,\delta)$$

Equation (6) has been grouped to illustrate that the cost of additional precaution, C_{π}, should equal the gain resulting from the reduction of expected damages, D_{π}, times the

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[12]Some readers have suggested that varying α instead of due care standards should allow us to achieve efficiency. However, varying α with the distance of observed care from the due care standards will not be enough to allow to achieve efficiency with uniform standards of due care. After all, if the duties of due care are the same, we cannot achieve efficiency under both systems when α has to be above 0 under comparative negligence but equal to 0 under contributory negligence. Incentives for care would differ.

[13]We assume throughout that the interesting case obtains—i.e., the solution to each party's problem is interior and care levels are greater than 0, but not so great as to make it impossible that a jury with an extreme underestimate of care would still find the plaintiff to be negligent. Technically, we assume $\pi \in [\bar{\pi}-w,\bar{\pi}+w]$ and $\delta \in [\bar{\delta}-w,\bar{\delta}+w]$. Thus, while Shavell (1987), prop 4.4, p. 95, presents a theory of negligence cutoffs when there are very small evidentiary errors, we present one where evidentiary errors are substantial.

share of expected damages borne by the plaintiff, plus the gain from the reduction in the chance that she will be held accountable for her own damages. The interpretation of equation (7) is parallel, although defendant and plaintiff liability is not symmetric and these asymmetries lead to differences in the expressions for the share borne by the defendant and the change in shares.[14]

2.4 The Best Standards of Care

Equilibrium care levels will depend upon both the comparative negligence sharing rule α and the standards of due care $\bar{\pi}$ and $\bar{\delta}$: We might imagine solving equations (6) and (7) to get the dependence of equilibrium care levels $\hat{\pi}$ and $\hat{\delta}$ on the standards of due care $\bar{\pi}$ and $\bar{\delta}$: $(\hat{\pi},\hat{\delta}) = g(\bar{\pi},\bar{\delta};\alpha)$. What would be the best due care standards? The best cutoffs $\bar{\pi}^*$ and $\bar{\delta}^*$ would be those such that the socially optimal levels of care that solve [SPP] are an equilibrium: $(\pi^*,\delta^*) = g(\bar{\pi}^*,\bar{\delta}^*;\alpha)$. (NB: We are suppressing the dependence of optimal due care standards on α, e.g., writing $\bar{\pi}^*$ instead of $\bar{\pi}^*(\alpha)$.)

How do $\bar{\pi}$ and $\bar{\delta}$ depend on α? Edlin (1992) performed the operation described above for a particular specification of this model where costs were given by $C(\pi)=\pi^2 c_1$ and $C(\delta)=\delta^2 c_2$ and damages were given by $D(\pi,\delta) = \max\{\overline{D} - \pi b_1 - \delta b_2, 0\}$. Since that paper assumed particular functional forms for costs and damages, it was possible to explicitly solve for the due care standards $\bar{\pi}^*$ and $\bar{\delta}^*$ as a function of α that induce efficient care-taking π^* and δ^*. Interestingly, as the sharing parameter α rose, the standard of due care for the plaintiff rose as well. The standard of due care also rose for the defendant, although that paper failed to make that point. As we will show here, it turns out that those two results are not specific to the particular cost and damage functions assumed in Edlin (1992).

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[14]Checking second-order conditions, the reader will see that first-order conditions are sufficient since each party's problem is a strictly concave programming problem. The assumption of the convexity of cost and damage functions which ensured that first-order conditions gave the unique social optimum also ensures defendant's and plaintiff's problems are solved by solutions to (6) and (7).

To understand why courts should be more strict in determining negligence when there is more damage sharing, consider increasing α. As we vary the sharing parameter α, how can the negligence cutoffs $\bar{\pi}$ and $\bar{\delta}$ be varied so that the socially optimal levels of care π^* and δ^* continue to solve equations (6) and (7)? Consider the plaintiff first. What change in $\bar{\pi}$ will lead the plaintiff to maintain care at π^* given that the defendant is somehow induced to maintain care at δ^*? When we are evaluating the plaintiff's first-order condition (6) at optimal care levels, it simplifies somewhat to (6') below; the simplification results from the fact that the societal cost savings from increased care are matched by the reduction in expected damages (i.e., $C_\pi(\pi^*) = -D_\pi(\pi^*,\delta^*)$).

$$(6') \quad 0 = -D_\pi(\pi^*,\delta^*)\left[(1-\alpha)F(\bar{\delta}^* - \delta^*)F(\bar{\pi}^* - \pi^*) - F(\bar{\delta}^* - \delta^*)\right] + (1-\alpha)F(\bar{\delta}^* - \delta^*)D(\pi^*,\delta^*).$$

In order to maintain equality (6') as α rises, $F(\bar{\pi}^* - \pi^*)$, the chance that the plaintiff is accidentally ruled to be negligent, must rise as well. This can easily be verified by dividing through (6') by $(1-\alpha)F(\bar{\delta}^* - \delta^*)\, D_\pi(\pi^*,\delta^*)$. After the division it will be seen that for (6') to hold, $F(\bar{\pi}^* - \pi^*) - \frac{1}{1-\alpha}$ must equal $D(\pi^*,\delta^*)/D_\pi(\pi^*,\delta^*)$. The right-hand side of this expression is fixed. Consider the left-hand side. As α increases, $1/(1-\alpha)$ increases, and so $F(\bar{\pi}^* - \pi^*)$ must increase as well, so that the left-hand side remains constant and the equality is maintained.

To understand this intuitively, consider the gain to the plaintiff from taking more care. Conditional upon the defendant being found not negligent, the plaintiff realizes no marginal gain from extra care when the plaintiff is already taking the socially optimal level of care. After all, the socially optimal levels of care are such that the marginal cost of care equals the marginal reduction in damages, and conditional on a finding of "defendant not negligent," the plaintiff bears all the costs of both her caretaking and damages, no matter what α is.

Now, consider a finding of defendant negligence. The second term on the right-hand side of equation (6') captures the fact that extra care reduces the chance of being

found negligent when the defendant is also negligent. The plaintiff's expected marginal gain from reduced chance of being found negligent, conditional on defendant negligence, is quantified as $(1-\alpha)D(\pi^*,\delta^*)$.[15] This gain is reduced as α increases because the plaintiff bears a smaller proportion of damages in the event that both parties are found negligent. Decreasing the chance of being found negligent is thus less valuable.

To compensate for these diminished incentives, there must be a larger gain arising from the first term on the right-hand side of equation (6'). This term captures the marginal reduction in total expected damages from increased care times the average share of total damages borne by the plaintiff conditional on a finding of defendant negligence. There must be an increase in the average share of damages borne by the plaintiff conditional on defendant negligence, i.e., in $(1-\alpha)F(\bar{\pi}^* - \pi^*)$. As α goes up, a larger share is borne by the defendant in the event that both parties are negligent. The direct effect of α increasing is thus that the plaintiff bears less in conditional expected value terms. This direct effect must be counter-balanced by finding the plaintiff negligent significantly more often. An increased chance of negligence shifts weight from contingencies where the plaintiff bears no damages because only the defendant is found negligent, to contingencies where the plaintiff bears a share of damages because both are found negligent.[16]

The bottom line then, is that if courts switch to comparative negligence, $F(\bar{\pi}^* - \pi^*)$, and hence $\bar{\pi}^*$, must increase to ensure that the plaintiff does not change her care level. A similar result holds under comparative negligence if courts begin to share more damages in the event that both parties are found negligent. What would be judged a little negligent under comparative negligence, should be judged not at all negligent under contributory negligence.

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[15]We have divided the term by the chance of defendant negligence in order to condition it on a finding of defendant negligence.

[16]Note that changes in the probability that the defendant is negligent, $F(\bar{\delta}^* - \delta^*)$, are not relevant to this calculation since we are conditioning on defendant negligence throughout this discussion. Equivalently, $F(\bar{\delta}^* - \delta^*)$ could be divided out as previously observed.

Leniency in the standard of due care should also be granted to the defendant under contributory negligence. The reasons are slightly more subtle, and will make use of the results we found for the plaintiff. From equation (6'), we see that as α varies, $\bar{\pi}^*$ must be adjusted so as to keep (1-α) proportional to $[1+(\alpha-1)R(\bar{\pi}^*-\pi^*)]$: i.e., $1-\alpha=[1+(\alpha-1)F(\bar{\pi}^*-\pi^*)][-D_\pi(\pi^*,\delta^*)/D(\pi^*,\delta^*)]$. Therefore, as α rises and $(1-\alpha)$ correspondingly falls, $\bar{\pi}^*$ must be adjusted so that $[1+(\alpha-1)R(\bar{\pi}^*-\pi^*)]$ falls as well.[17] This fact is useful in a rearranged version of equation (7): We can rearrange (7) as in equation (7'):

(7') $C_\delta(\delta^*)=-D_\delta(\pi^*,\delta^*)F(\bar{\delta}^*-\delta^*)[1+(\alpha-1)R(\bar{\pi}^*-\pi^*)]+[1+(\alpha-1)F(\bar{\pi}^*-\pi^*)]D(\pi^*,\delta^*)$.

Dividing through by $[1+(\alpha-1)R(\bar{\pi}^*-\pi^*)]$ yields

(8) $C_\delta(\delta^*)/[1+(\alpha-1)R(\bar{\pi}^*-\pi^*)]=-D_\delta(\pi^*,\delta^*)F(\bar{\delta}^*-\delta^*)+D(\pi^*,\delta^*)$.

Observe that $C_\delta(\delta^*)$, $-D_\delta(\pi^*,\delta^*)$ and $D(\pi^*,\delta^*)$ do not vary with α. Moreover, we showed above that in order to make the plaintiff take efficient care, $[1+(\alpha-1)R(\bar{\pi}^*-\pi^*)]$ falls when α rises. This implies the left-hand side of equation (8) rises as α rises. To maintain equality, $F(\bar{\delta}^*-\delta^*)$ must rise as well. This implies that there must also be a stricter standard of negligence for the defendant as α rises, or, viewed alternatively, there must be more leniency under contributory negligence.

The following proposition summarizes the results we have established:

Proposition: Under comparative negligence, inducing efficient care-taking when there are evidentiary errors involves

1. *a stricter standard of due care for the plaintiff,*
2. *a stricter standard of due care for the defendant, and*
3. *a larger share of damages shifted on average to the defendant*

than under contributory negligence. The same results hold when contrasting two comparative negligence systems, one of which involves less damage shifting from plaintiff to defendant in the event that both parties are negligent.

[17]The two expressions fall together because they are proportional *and* both positive.

To get some intuition about the result that courts should be more lenient to the defendant under contributory negligence, the reader may find it helpful to recall that increasing care brings the defendant two benefits: (1) it decreases the expected damages from accidents; and (2) it decreases the chance that the defendant is found negligent, and so decreases the defendant's share of the expected damages. The first term in equation (7') represents the marginal decrease in expected damages from increased care-taking times the average share of damages borne by the defendant; the second term represents the decreased share of damages from increased caretaking times total expected damages.

Consider the defendant's second incentive for care-taking, the second term in equation (7'). As α increases, the defendant bears a larger portion of damages when both are negligent, and so saves more from avoiding this event. However, increasing care also gives benefits to the defendant in contingencies where the plaintiff is found not negligent. As α increases, the plaintiff is less often found not negligent, so these benefits fall. Since these effects offset each other, we might expect the net effect to be ambiguous. However, we can actually say that the second effect is larger and that in net these gains should fall as α rises.

In order to make the plaintiff take appropriate care, we found previously that courts had to adjust care standards so that *conditional on defendant negligence*, the plaintiff bears a higher share of damages when α is higher. It is a corollary that conditional on defendant negligence, *the defendant* bears a lower share of damages when α is higher. The defendant's gain from not being found negligent therefore decreases with higher α, since the defendant bears no damages when he is not negligent, regardless of α. Thus, the second term in equation (7') tends to make the defendant take less care as α increases.

Therefore, the first term in equation (7') must increase as we increase α, in order to maintain the equality so that the defendant does not seek to vary his care-taking. The average share of damages borne by the defendant must increase, i.e.,

$F(\bar{\delta}^* - \delta^*)[1+(\alpha-1)F(\bar{\pi}^* - \pi^*)]$ must increase.[18] This requires an increase in the chance of defendant negligence, and so a stricter standard of due care. (Remember that conditional upon defendant negligence, we have already determined that the defendant's share, $[1+(\alpha-1)F(\bar{\pi}^* - \pi^*)]$, decreases.)

2.5. An Example

A numerical example may help to illustrate the points we have made. Suppose $C(\pi)=\pi^2$, $C(\delta)=\delta^2$, and $D(\pi,\delta)=\max\{20-4\pi-4\delta,0\}$. Then optimal care levels are given by $\pi^*=2$ and $\delta^*=2$.

Suppose the standards of due care are set at the social optimum $\bar{\pi}=2$ and $\bar{\delta}=2$. Then if care is observed perfectly, we can easily verify that it is an equilibrium under either comparative or contributory negligence for the plaintiff and the defendant to choose care levels $\hat{\pi}=2$ and $\hat{\delta}=2$. This is the now-standard result that both negligence systems are efficient when care is perfectly observable. If we introduce evidentiary uncertainty, it is possible that either the plaintiff or the defendant may deviate.

Consider the plaintiff's marginal benefit from care when $\pi=2$ and $\delta=2$. When $F(u)=.5+u$, $u\in[-\frac{1}{2},\frac{1}{2}]$, the plaintiff's marginal benefit from extra care can be determined from equation 6, and is $[1-3\alpha]$.

When $\alpha=0$, the plaintiff has an incentive to be more cautious. As α rises, the plaintiff's incentive to take care falls, all else equal. When $\alpha=1$, the plaintiff will take less than optimal care, because there is no penalty for being found negligent. The only gains are from reduced damages, and these are only internalized when the defendant is not negligent.

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[18]Note that in the argument given above, we said that the average share of damages borne by the plaintiff *conditional upon defendant found negligent* must increase. Because of the conditioning, there is no contradiction between this statement and requiring an increase in the average share of damages borne by the defendant. The plaintiff bears a lower average share of damages because the chance that the defendant is found negligent is increased, and of course the defendant bears more damages when negligent under either system.

It is important to note that evidentiary uncertainty does not necessarily lead to overprecaution. Whether it does depends on α.

The reader can check herself from the first-order conditions, or by referring to Edlin (1992), to see that whenever there are interior solutions, the optimal standards of due care are given by

$$\pi^* = 1 + .5\left(\frac{1+\alpha}{1-\alpha}\right)$$

$$\delta^* = .5 + \left(\frac{1}{1-(1-\alpha)F(\pi^*-2)}\right).$$

Under contributory negligence (α=0), setting due care standards leniently at $\pi^* = 1.5$ and $\delta^* = 1.5$ is optimal. Under these standards taking optimal care $\hat{\pi} = 2$ and $\hat{\delta} = 2$ is an equilibrium. In this equilibrium, neither defendant nor plaintiff is ever found negligent. Even when the jury grossly underestimates care, drawing u = -.5, the jury will still think care is 1.5, meeting the duty of care. As a consequence, the plaintiff would never consider bringing a case. The plaintiff bears all damages.

In contrast, under comparative negligence, with α=4/10, stricter standards of care are optimal. Standards should be set at $\pi^* = \frac{13}{6}$ and $\delta^* = \frac{13}{6}$. Given α=4/10, these standards again make efficient care-taking an equilibrium. Now both defendant and plaintiff are found to be negligent two-thirds of the time. As a consequence, the defendant now bears a sizable fraction of the plaintiff's expected damages. A fraction 2/9 of the time only the defendant is negligent, so the defendant bears all damages, and 4/9 of the time, the defendant bears 4/10 of damages. On average, the defendant bears 4/10 of the damages.

As was explained in the last section, on average the defendant bears a larger share of damages when α is larger. One disadvantage of comparative negligence is therefore that it may induce more litigation without bringing compensating gains in deterrence.

3. Conclusion

We have explained that even when juries cannot observe the true level of care-taking, courts can still induce parties to undertake efficient care by choosing standards of

due care different from the care levels that would be socially efficient for parties to undertake. However, the appropriate standards to induce efficient care-taking depends upon whether the apportionment rule when both parties are found negligent is contributory or comparative negligence. The more damages are borne by the defendant in the event that both parties are found negligent, the stricter should be the negligence standards for both parties.

Of course, neither the law of horn books nor jury instructions provides much foundation for varying the determination of negligence with the legal negligence regime of a jurisdiction. A typical description of negligence is "the failure to use ordinary or reasonable care," and could as easily be found in a jury instruction from a comparative as from a contributory negligence jurisdiction.[19] In turn, ordinary care is defined in *Brown v. Kendall*,[20] a leading case establishing negligence as central to liability determination, as "that kind and degree of care, which prudent and cautious men would use, such as is required by the exigency of the case, and such as is necessary to guard against probable danger."[21] No reference is made in these definitions to the apportionment rule when both parties are negligent.

Although these abstract formulations of negligence are not dependent upon the system of damage apportionment to be used after the negligence determination, it is doubtful that this independence could be so generally preserved in practice. As we maintained in the introduction, juries are probably more lenient to plaintiffs on the question of negligence in contributory negligence jurisdictions. Equity is the usual rationale for this, but the model we present justifies this disparate treatment on efficiency grounds. There is,

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[19]This quote is from the model jury instruction on negligence in California (BAJIC 7th ed., 1986, §3.10).

[20]*Brown v. Kendall*, 6 Cush. (60 Mass.) 292, 1850.

[21]This early expression is almost identical to that in the model jury instructions in California (BAJIC 7th ed., 1986, §3.10), which state that, "Negligence is the doing of something which a reasonably prudent person would not do, or the failure to do something which a reasonably prudent person would do, under circumstances similar to those shown by the evidence."

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