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JOINT TORTFEASORS

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Abstract

This chapter compares the properties of joint and several liability with those of non-joint liability. It considers three criteria: deterrence, settlement inducing properties and fairness. The analysis is performed for both full and limited solvency.

The central conclusion is that neither rule dominates the other. With respect to deterrence, the relative desirability of the two rules depends on the levels of solvency of the defendants. In contrast, with respect to settlements and fairness, the comparison turns on the correlation of the plaintiff's probabilities of succes against the defendants.
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1. Introduction

The law and economics analysis of joint tortfeasors focuses on the comparison between joint and several liability and non-joint (several only) liability. Part A provides a brief background of the legal regimes. Parts B, C and D compare, respectively, the deterrence, settlement effects and fairness of the two rules.

A. Legal Regimes

2. Legal Regimes

The choice between joint and several liability and non-joint liability arises in situations in which the plaintiff's injury results from the actions of multiple parties. Under joint and several liability, if the plaintiff litigates against many defendants and prevails against only one, he can recover his full damages from that defendant; if the plaintiff prevails against all defendants but some are insolvent, he can recover his full damages from the solvent defendants; and if the plaintiff prevails against all defendants and all are solvent, he can nonetheless choose to recover his full judgment from any defendant or to a recover a portion from each. In contrast, under non-joint liability, the plaintiff can recover from a losing defendant only the share of the damages attributable to that defendant.

For joint and several liability, the legal regime needs to be specified further. As shown in Kornhauser and Revesz (1993), the various choices presented below can affect the economic analysis of the consequences of joint and several liability.

First, a right of contribution permits a defendant that has paid a disproportionately large share of the plaintiff's damages as a result of the application of joint and several liability to obtain compensation from a defendant that has paid a disproportionately small share of these damages. Absent a right of contribution, such reallocation is not possible. Second contribution shares are usually determined either pro rata (equal division among the defendants) or by reference to comparative fault.

Third, the question of an appropriate set-off rule arises when the plaintiff settles with one defendant and litigates against the other. Under the pro tanto set-off rule, the plaintiff's claim against the non-settling defendant is reduced by the amount of the settlement. In contrast, under the apportioned share set-off rule (sometimes referred to as a proportional set-off rule), the plaintiff's claim against the non-settling defendant is reduced by the share of the liability attributable to the settling defendant.

Fourth, under the pro-tanto set-off rule, when one defendant settles and the other litigates and ultimately loses, the question arises whether the settling defendant is protected from contribution actions. Fifth, the legal regime must also specify whether settling defendants are entitled to bring contribution actions against defendants who settled for less than their share of the liability.

Sixth, under the pro-tanto set-off, if the plaintiff enters into an inadequately low settlement with one defendant, the other defendant is responsible for the shortfall if he litigates and loses. To protect the interests of non-settling defendants, courts sometimes require 'good faith' hearings on the adequacy of settlements.

Seventh, if the plaintiff joins all the joint tortfeasors in a single suit, his claims against all of them will be adjudicated in the same proceeding. If the plaintiff chooses not to join all the tortfeasors as defendants, the question arises whether a named defendant can join another tortfeasor as a third-party defendant. Otherwise, the named defendant would have to file a separate action for contribution after the adjudication of his liability to the plaintiff.

B. Deterrence

3. Deterrence: Several Remarks

We compare here the deterrence effects of joint and several liability and non-joint liability, when coupled with both rules of negligence and strict liability. We perform the comparison first for cases in which the defendants are fully solvent (Kornhauser and Revesz, 1989) and then consider the effects of limited solvency (Kornhauser and Revesz, 1990).

We develop our argument by reference to a model in which two firms, Row and Column, dump hazardous wastes at a single landfill. The actors benefit from this dumping because the wastes are the byproduct of profitable economic activity. At some time in the future, these wastes may leak into the environment and cause serious damage; we think of this damage as the cost of cleaning up the landfill and the surrounding area affected by the release. We take the damage function to be convex (the additional damage caused by one unit of waste increases with increasing amounts of waste in the landfill).

The expected damage of a release is a 'social' loss because it does not fall directly on the dumpers absent a legal provision shifting the liability to them. Instead, it falls on the victim that would have legal responsibility for the cleanup, or, alternatively, that would suffer the consequences if the problem were left unattended. Under our model, each dumper chooses the amount of waste that it will dump.

The socially desirable amount of waste is that which maximizes the social objective function: the sum of the benefits derived by the actors minus the social loss. An economically rational firm, however, does not make this decision based on the social objective function. Instead, it seeks to maximize its private objective function: the benefit that she derives from the activity that leads to the production of the waste minus whatever share of the social loss the legal regime allocates to her.

We model a joint and several liability regime with contribution shares determined by reference to the amount of waste dumped. (Other rules are considered in Landes and Posner, 1980; Kornhauser and Revesz, 1989; Tietenberg, 1989 and Wright, 1988, pp. 1169-1179.) We assume that a plaintiff, say for example the government, sues both defendants in the same proceeding and we exclude the possibility of settlement (the deterrence effects

of joint and several liability when settlement is possible are analyzed in Kahan, 1996 and Spier, 1994).

4. Full Solvency: Negligence

We assume in the case of negligence that the standard of care will be chosen at the level that maximizes social welfare; departures from the social optimum in setting the standard of care are considered in Kornhauser and Revesz (1989, pp. 862-870). For expositional convenience, we assume that negligent actors are liable only for the losses that would have been prevented through due care (in this example, for the additional losses that result if a firm dumps more than the socially optimal amount, rather than the socially optimal amount). We show in Kornhauser and Revesz (1989) that essentially the same results hold if negligent actors are responsible for the full losses (even ones that would have occurred with due care).

Under these circumstances, joint and several liability will produce the socially optimal result. If one of the actors, say Row, is non-negligent, it would not be rational for Column to be negligent. If this actor were contemplating dumping more than the standard of care, she would face liability for the full increase in the resulting damage. If the standard of care is set at the social optimum, the increased benefits that this actor would obtain through negligent conduct would be less than the increase in the damage for which she would be liable. Thus, assuming that one of the actors is non-negligent, the remaining actor will be non-negligent as well. This argument shows that it is a Nash equilibrium for each actor to meet her standard of care.

We now show that this efficient Nash equilibrium is unique. Consider whether it would be rational for both actors to be negligent. These actors will, jointly, face liability equal to the full increase in the resulting damage. If negligent action on the part of these actors were preferable to non-negligent action for each of them, then the total social welfare would exceed that attainable when all actors meet the standard of care which, once again, is not possible if the standard of care is set at the social optimum. Thus, regardless of how the increased damage was allocated between the defendants, at least one of them would have to pay more than the increased benefit that it obtained by acting negligently. An equilibrium in which both actors are negligent is therefore not possible.

The analysis is different for a non-joint liability rule, under which a negligent defendant would not be liable for the share of the damage attributable to the non-negligent defendant. Instead, the negligent defendant would be liable for an amount proportional to waste that it had dumped. Assume that Row is non-negligent and that Column is contemplating dumping more than the standard of care. Column would then pay only a fraction of the increase in damage. Under this apportionment rule, the remainder of the increase would

be attributable to Row and would be unrecoverable by the plaintiff as a result of Row's lack of negligence. Thus, in this situation, non-joint liability leads to under-deterrence.

5. Full Solvency: Strict Liability

The analysis is different for strict liability. Under strict liability, as long as both actors are fully solvent, there is no difference between joint and several liability and non-joint liability. Strict liability ensures that the victim is compensated for the full damage and thus the question whether the victim will have to bear the share of the damage caused by the actions of non-negligent defendants does not arise.

Assume that Row is dumping the optimal amount of waste (the amount that would have met the standard of care if a rule of negligence had been in effect) and that Column is contemplating whether to dump more than this amount. Such a decision on the part of the Column would, of course, increase the damage to the victim. Column would, in turn, be liable for a larger share of the damage, as he would pay in proportion to the amount of waste that he dumped. As long as the damage function is convex, however, the increase in Column's liability is less than the increase in the social loss. Thus, Column's decision to dump more than the socially optimal amount has the effect of increasing Row's liability as well. As a result of this externality, strict liability leads to under-deterrence, regardless of whether it is coupled with joint and several liability or non-joint liability.

Miceli and Segerson (1991) consider a modification of the strict liability rule that does in fact lead to efficiency both in terms of the level of care adopted and of entry into the activity. Under their formulation, each actor is responsible for the marginal damage that it causes. This rule, coupled with the assumption of convex costs, implies that the total payments from two defendants would exceed the plaintiff's actual damages.

6. Limited Solvency

Here, each defendant is defined not only by her benefit function (the rate at which her generation of waste is transformed into net benefits) but also by a fixed solvency, which represents the actor's available amount of assets to offset her share of the social loss. Under this formulation of the problem, the actors cannot shed their solvencies over time. We present here the analysis for strict liability, which makes it possible to explain the basic intuitions. The comparison of joint and several liability and non-joint liability under negligence when the actors have limited solvency is presented in Kornhauser and Revesz (1990).

Consider a situation under which Row's solvency is zero and Column's solvency is infinite, and that both firms are otherwise identical. The liability

rule thus transmits no deterrence incentive to Row. Row will therefore dump up to the point at which any additional benefit (in terms of reduced costs of production) from additional dumping becomes zero. This amount, which we call x^H, is greater than $x(4)$, the amount that Row would have dumped if both defendants had been infinitely solvent. Note that, as a result of the underdeterrence caused by strict liability, discussed above, $x(4)$ is in turn larger than x^*, the socially optimal amount of dumping by Row.

Under joint and several liability, because Row has no solvency, Column will be responsible for the whole liability and will dump an amount a (smaller than x^*), which is the optimal amount of dumping by Column conditional on Row being insolvent. The equilibrium is thus (x^H, a). If Column is not infinitely solvent, there are two possible equilibria: (x^H, a), if Column's solvency is greater than a critical solvency which we call s_j or (x^H, x^H), if Column's solvency is lower.

In contrast, under non-joint liability, Column is not responsible for the whole liability, but only for its proportional share. If Column has infinite solvency, it will dump b, an amount larger than a, though smaller than x^*. Here, too, there are two possible equilibria if Column is not infinitely solvent: (x^H, b), if Column's solvency is greater than a critical solvency which we call s_{nj} or (x^H, x^H), if Column's solvency is lower. Because for any level that it dumps Column faces less liability under a rule of non-joint liability, over a larger range of solvencies it chooses to act as if it were infinitely solvent rather than wholly insolvent. Thus, s_{nj} is smaller than s_j. Table 1 summarizes the relevant equilibria.

Table 1
Equilibria Under Joint and Several Liability and Non-Joint Liability

Region	Column's Solvency	Equilibria	
		Joint and Several Liability	Non-Joint Liability
A	$0 - s_{nj}$	(x^H, x^H)	(x^H, x^H)
B	$s_{nj} - s_j$	(x^H, x^H)	(x^H, b)
C	$s_j - 4$	(x^H, i)	(x^H, b)

In region C in Table 1, joint and several liability is therefore preferable to non-joint liability. From a social welfare perspective, an equilibrium at (x^H, a) is preferable to an equilibrium at (x^H, b). When one actor is generating x^H, joint and several liability makes the other actor see the full social cost of its actions, whereas non-joint liability does not. Thus, a is the optimal response by Column to Row's choice of x^H.

In region B, however, the reverse is true. Joint and several liability induces Column to act in the same manner that it would if it were wholly insolvent, dumping x^H, whereas non-joint liability induces Column to act in the same manner that it would if it were infinitely solvent, dumping b. Thus, in this region, non-joint liability has better social welfare properties. (Of course, in region A, both rules have the same properties.)

This discussion illustrates that, when solvency is limited, neither rule dominates the other. (The same is true under negligence (Kornhauser and Revesz, 1990.) The intuition behind this result is that Row's insolvency creates a 'domino' effect, leading Column, under certain circumstances, to act as if it were insolvent as well. Because under joint and several liability Column is responsible for a greater proportion of the total harm, the range under which this 'domino' effect occurs is greater. In a model in which an actor's probability of insolvency is independent of the other actor's solvency (or probability of insolvency), a 'domino' effect is not possible and the results are different (Watts, 1998).

C. Settlements

7. Settlement: Basic Framework

The basic framework for the analysis of the impact of joint and several liability on settlements is set forth in Kornhauser and Revesz (1994a), which deals with fully solvent defendants, and Kornhauser and Revesz (1994b), which deals with potentially insolvent defendants. The discussion here proceeds by reference to a numerical example, as in Kornhauser and Revesz (1993, 1995), which serves to illustrate in a straightforward manner the game-theoretic interactions generated by the competing rules.

We model the following rule of joint and several liability. First, there is a right of contribution among defendants found jointly and severally liable. Second, in contribution actions, the relevant shares are determined by reference to the amount of waste dumped. Third, following a settlement, the plaintiff's claim against the nonsettling defendants is reduced by the amount of the settlement (a pro tanto set-off rule); the effects of different formulations of the apportioned share set-off rule are analyzed in Kornhauser and Revesz (1993, p. 465-469) and Klerman (1996). Fourth, a settling defendant is protected from any contribution actions. Fifth, a settling defendant can bring contribution actions against non-settling defendants. Sixth, there is no detailed judicial supervision of the substantive adequacy of settlements. Seventh, the claims involving the joint tortfeasors are litigated together in a single proceeding. Kornhauser and Revesz (1993) show that the results derived here are robust to many changes in the legal regime governing joint and several liability.

To perform the comparison between joint and several liability on the one hand and non-joint liability on the other, we consider a situation in which the plaintiff has a claim of $100 against two defendants, Row and Column, each equally at fault. All the parties are risk neutral. We assume initially that the defendants are sufficiently solvent that they can satisfy the plaintiff's judgment. Later, we consider the effects of limited solvency.

The probability that the plaintiff will prevail against each defendant is 50 percent. All the parties have accurate information about this value and the costs of litigation are zero. As shown in Kornhauser and Revesz (1994a), the results derived here hold even if the two defendants were not equally at fault, if the plaintiff's probability of success were not 50 percent, and if litigation costs are not zero.

With respect to the relationship between the plaintiff's probabilities of success against the two defendants, we consider two polar situations. In the first, these probabilities are independent. Thus, the plaintiff's probability of success against one defendant is 50 percent regardless of whether the plaintiff has prevailed against, lost to, or settled with, with the other defendant.

In the second case, the probabilities are perfectly correlated. Thus, if the plaintiff litigates against both defendants, it either prevails against both (with a probability of 50 percent) or loses to both (also with a probability of 50 percent).

The parties may either litigate or settle the claim. Settlement negotiations have the following structure. The plaintiff makes settlement offers to the two defendants. Row and Column decide simultaneously whether to accept these offers. (The effects of different offer structures are examined in Donohue, 1994; the effects of 'Mary Carter' agreements between the plaintiff and a subgroup of defendants is analyzed in Bernstein and Klerman, 1995). We assume that defendants' costs of coordinating their actions are sufficiently high that they act non-cooperatively. The plaintiff then litigates against the non-settling defendants, if any. We adopt the convention that, if a party is indifferent between settlement and litigation, it settles.

The central conclusion of our analysis is that the comparison of the settlement inducing properties of joint and several liability and non-joint liability depends critically on the correlation of the plaintiff's probabilities of success. When these probabilities of success are independent, joint and several liability unambiguously discourages settlements, relative to non-joint liability. When, in contrast, these probabilities are perfectly correlated, joint and several liability has a more complex effect: it encourages settlement when the litigation costs are low, but may discourage settlements when these costs are high (Kornhauser and Revesz, 1994a). Earlier analyses had focused, implicitly, only on perfectly correlated probabilities (Easterbrook, Landes, and Posner, 1980; Polinsky and Shavell, 1981).

A recent experimental study of auditors' liability considers a more complicated correlation structure under which the probabilities are perfectly correlated if the manager is not liable (because under the securities' laws the

auditor then cannot be liable) but independent if the manager is liable (Dopuch, Ingberman, and King, 1997).

8. Non-Joint Liability

The analysis of the choice between settlement and litigation under non-joint liability is straightforward. The plaintiff's expected recovery from litigation is $50: she has a 50 percent probability of obtaining $50 from each defendant; each defendant's expected loss is therefore $25. Absent litigation costs, the plaintiff and the defendants are indifferent between litigation and settlement. For any level of litigation costs, settlement becomes preferable. For example, if each party's litigation costs were $5, the plaintiff's expected recovery from litigation would be only $20 and each defendant's expected loss would be $30. The plaintiff and each defendant would prefer any settlement between $20 and $30 to litigation.

The result that under non-joint liability the parties are indifferent between settlement and litigation in the absence of litigation costs and prefer to settle for any level of litigation costs does not change if the defendants have limited solvency. Say, for example, that Row's solvency is only $20. Then, in the absence of litigation costs, the plaintiff and Row are indifferent between litigation and a settlement for the plaintiff's expected recovery of $10 (a 50 percent probability of recovering Row's solvency of $20). For any level of litigation costs, the parties prefer to settle. Thus, while limited solvency affects the expected value of the plaintiff's claim as well as amount at which the case would settle, it does not affect the choice between settlement and litigation.

9. Joint and Several Liability

Independent Probabilities

As a consequence of joint and several liability, the plaintiff recovers his full damages not only if he prevails against both defendants but also if he prevails against one and loses to the other. When the plaintiff's probabilities of success against the two defendants are independent, each of four different scenarios carries a probability of 25 percent: that the plaintiff prevails against both defendants, that the plaintiff prevails against Row and loses to Column, that the plaintiff prevails against Column and loses to Row, and that the plaintiff loses to both defendants. In the first three cases, carrying an aggregate probability of 75 percent, the plaintiff recovers his full damages of $100. Thus, his expected recovery from litigating with both defendants is $75. In turn, each defendant's expected loss is $37.50. We proceed by analyzing a situation in which litigation costs are zero.

A risk-neutral plaintiff will not accept a settlement with both defendants that yields less than $75, but would find acceptable an aggregate settlement for

$75 or more. What would happen if the plaintiff made settlement offers to the two defendants for $37.50 each, so that its aggregate recovery was equal to the expected recovery of litigating against both defendants? If one defendant, say Row, accepted the offer, would the other defendant accept it as well? Column would accept the settlement only if his expected loss from litigation is at least $37.50. Under the pro tanto set-off rule, Column's exposure in the event of litigation is reduced to $62.50: the plaintiff's damages of $100 minus Row's settlement of $37.50. But Column faces only a 50 percent probability of losing the litigation. Thus, in light of Row's settlement, its expected loss from litigation is only $31.25.

It therefore follows that if the plaintiff were to make offers of $37.50 to each defendant, at least one of them would reject the offer. The plaintiff's expected recovery would then be $68.75 (Row's settlement of $37.50 plus an expected recovery of $31.25 from litigating against Column). This amount is lower than the plaintiff's expected recovery from litigating against both defendants. Thus, the plaintiff would never make offers of $37.50 to each defendant. Similar logic establishes that no other pair of offers would give the plaintiff an expected recovery of at least $75 and yet be acceptable to the two defendants. Also, there is no scenario under which the plaintiff would receive an expected recovery of at least $75 by settling with one defendant and litigating against the other.

This phenomenon has two sources (1) the surplus that the plaintiff obtains from litigation as a result of joint and several liability when its probabilities of success against the defendants are independent, and (2) the benefit that a non-settling defendant receives from the set-off created by the plaintiff's settlement with the other defendant.

If the plaintiff were litigating against only one defendant rather than two,his expected recovery from litigation would be $50 rather than $75: he would have a 50 percent probability of recovering from that defendant its full damages of $100. Similarly, as we have indicated, if the plaintiff were litigating against two defendants under non-joint liability, his expected recovery would also be $50: he has a 50 percent probability of recovering $50 from each of the defendants. Finally, if the plaintiff were litigating against two defendants under joint and several liability but his probabilities of success against the defendants were perfectly correlated, he would also have an expected recovery of only $50 (a 50 percent probability of recovering his full damages if he prevails against both defendants).

As a result of the surplus that the plaintiff obtains from litigating under joint and several liability when the probabilities of prevailing are independent, the plaintiff will not accept from one defendant a settlement that is too low even if he intends to litigate against the other. Say, for example, that the plaintiff accepted a settlement of $0 from Row and litigated against Column. His expected recovery would then be only $50 (a 50 percent probability of recovering $100); the settlement with Row would have reduced his expected recovery by $25. If the plaintiff accepted a settlement of $10 from Row, his

expected recovery from litigating with Column would be $45 (a 50 percent probability of recovering $90), for a total expected recovery of $55; the loss from the low settlement with Row would be $20.

So as not to lose his surplus, the plaintiff would thus have to demand a sufficiently high settlement from Row. But a settlement that is sufficiently desirable for the plaintiff to accept confers a benefit upon Column. If, for example, the plaintiff were to settle with Row for $25, Column's expected loss from litigation would be $37.50 - the same expected loss as if Row litigated. Any higher settlement with Row reduces Column's expected loss. We have already shown that a settlement with Row for $37.50 reduces Column's expected loss from $37.50 to $31.25, giving him a benefit of $6.25. In order to recover $75, the plaintiff would have to obtain from Row a settlement of $50 (which would leave an expected recovery from Column of $25 and confer upon Column a benefit of $12.50). Row, however, would not agree to such a settlement because, given that Column litigates, he is better off litigating as well and facing an expected loss of only $37.50.

We have thus illustrated why the plaintiff cannot capture the full benefit of Row's settlement if his probabilities of success are independent. Part of this settlement confers an external benefit upon Column. It is this externality that stands in the way of settlement. Indeed, the only way that the plaintiff can obtain the full benefit of a defendant's payment is by litigating, because if he settles, part of the benefit accrues to the other defendant, reducing the plaintiff's expected recovery from litigation.

The role of joint and several liability in discouraging settlements is not limited to the case in which litigation costs are zero. The externality described above also impairs the possibility of settlement when litigation when litigation costs are positive but lower than a particular threshold.

Perfectly Correlated Probabilities

The problem changes considerably when the plaintiff's probabilities of success against both defendants are perfectly correlated. If the plaintiff litigates against both defendants, he either prevails against both (with a probability of 50 percent) or loses against both (also with a probability of 50 percent). His expected recovery from litigation is $50 rather than $75; each defendant's expected loss is then $25.

In the case of perfectly correlated probabilities, the plaintiff will settle with both defendants. It is easy to see that the plaintiff will settle with at least one of the defendants. Say that the plaintiff settles with Row for $10. He faces a 50 percent probability of recovering $90 from Column, and his total expected recovery is $55 - $5 higher than his recovery from litigating against both defendants. The effect of this settlement is to give the plaintiff $10 with certainty, but reduce his expected recovery from litigation by $5. As a result, settlement with one defendant and litigation against the other is always more attractive to the plaintiff than litigation against both defendants. Unlike the

case of non-joint liability, where the parties are indifferent between settlement and litigation when litigation costs are zero, here there is a positive surplus that the plaintiff and a defendant can divide if a settlement takes place.

It is also easy to show that, for the example that we are analyzing, the plaintiff in fact settles with both defendants, for $25 and $37.50, respectively. Given that Row settles for $25, Column's expected loss through litigation is $37.50 (a 50 percent probability of paying the plaintiff's damages of $100 minus Row's settlement of $25), and would therefore accept a settlement for that amount. Moreover, given that Column settles for $37.50, Row's expected loss through litigation is $31.25 (a 50 percent probability of paying the plaintiff's damages of $100 minus Column's settlement of $37.50), and would therefore prefer to settle for $25. The same argument establishes that the plaintiff would be no better off settling with one defendant and litigating against the other.

We show elsewhere that, for perfectly correlated probabilities, the plaintiff settles with both defendants if their shares of the liability are sufficiently similar, and settles with one defendant--the one with the larger share of the liability - and litigates against the other if the defendant's shares of the liability are sufficiently different (Kornhauser and Revesz, 1994a).

The Effects of Limited Solvency

As indicated above, under non-joint liability, the limited solvency of the defendants does not affect the choice between settlement and litigation. The situation is different under joint and several liability. We consider first how limited solvency would affect the choice between settlement and litigation if the plaintiff's probabilities of success are independent. If one of the defendants, say Row, has limited solvency, the plaintiff nonetheless litigates against both defendants if this solvency is above a threshold. For example, if Row's solvency is $80 and the plaintiff litigates against both defendants, his expected recovery is $37.50 from Column but only $32.50 from Row (with a probability of 25 percent, the plaintiff prevails against both defendants and recovers $50 from Row, and, also with a probability of 25 percent, the plaintiff prevails only against Row and recovers Row's solvency of $80 rather than its full damages of $100). In contrast, if the plaintiff settles with Column for $37.50, Row's expected loss from litigation, and consequently the maximum settlement that it would offer, would be only $31.25 (a 50 percent probability of paying the plaintiff's damages of $100 minus Column's settlement of $37.50).

When Row's solvency is sufficiently low, however, the plaintiff settles with both defendants. Consider the case in which Row's solvency is $40. If the plaintiff litigates against both defendants his expected recovery is $60 (with a probability of 25 percent, he prevails only against Column and recovers $100; with a probability of 25 percent, he prevails against both and recovers $40 from Row and $60 from Column; and with a probability of 25 percent, he prevails only against Row and recovers $40). In turn, Row's expected loss is $20 and Column's expected loss is $40.

If the plaintiff offered Row a settlement of $20, his expected recovery from Column is $40 (a 50 percent probability of recovering his damages of $100 minus Row's settlement of $20), and Column would be willing to settle for this amount. In turn, if the plaintiff offered Column a settlement of $40, his expected recovery from Row is $20 (a 50 percent probability of recovering his solvency of $40), and Row would be willing to settle for this amount. Thus, as in the case of non-joint liability, when the solvency of one of the defendants is sufficiently low and litigation costs are zero, the parties are indifferent between settling and litigating.

In summary, the result that joint and several liability discourages settlements when the plaintiff's probabilities of success are independent holds over a range of solvencies. A similar analysis (Kornhauser and Revesz, 1994b) establishes that, when the plaintiff's probabilities of success are perfectly correlated, joint and several liability promotes settlements over a range of solvencies. For solvencies below a given threshold, however, joint and several liability has the same settling- inducing properties as non-joint liability. The relevant results are summarized in Table 2.

Table 2
Effects of Joint and Several Liability on Settlements Under Different Levels of Solvency Relative to Non-Joint Liability

	High Solvency	Low solvency
Independent probabilities	Discourages settlement	Neutral effect
Perfectly correlated probabilities	Encourages settlement	Neutral effect

D. Fairness

10. Fairness: Several Remarks

The comparison of the relative fairness of joint and several liability and non-joint liability raises four principal issues (Kornhauser and Revesz, 1995). Three of these issues arise when the defendants are fully solvent: (1) the size of the plaintiff's expected recovery when she litigates against the defendants; (2) the division of the plaintiff's recovery among litigating defendants; and (3) the effects of settlements. A fourth issue arises when the defendants have limited solvency: the division of the burden of insolvency between the plaintiff and the solvent defendant (Wright, 1992). A question relevant to all four issues is whether one should assess fairness *ex ante* (in terms of the parties' expected payments) or *ex post* (in terms of the actual payments in particular cases). We largely confine our remarks here to ex ante assessments.

11. Size of the Plaintiff's Recovery

First, as indicated in Part C, except when the plaintiff's probabilities of success against the defendants are perfectly correlated, joint and several liability leads to a higher expected recovery than non-joint liability. Recall the example in which the plaintiff's damages are $100 and her probabilities of success against each of the defendants are 50 percent, and the defendants are equally at fault and fully solvent. The plaintiff's expected recovery is $50 under non-joint liability, $50 under joint and several liability when the plaintiff's probabilities of success are perfectly correlated, and $75 under joint and several liability when the plaintiff's probabilities of success are independent. (In the range between independence and perfect correlation, the plaintiff's recovery is between $50 and $75.)

Thus, except when the plaintiff's probabilities of success are perfectly correlated, an effect of joint and several liability is to transfer resources from the defendants to the plaintiff. The fairness consequence of this transfer depends upon why the plaintiff's probability of success against each of the defendants is only 50 percent. It could be that the defendants are in fact liable but that the plaintiff has difficulty in proving their liability. In this case, joint and several liability is attractive on fairness grounds because it brings a defendant's expected liability closer into line with the harm that it caused.

Alternatively, it could be that there is true uncertainty about whether the defendants are liable, and that this uncertainty is captured by the 50 percent probability. Then, joint and several liability is undesirable because it increases a defendant's expected liability beyond the level of the harm the defendant caused.

12. Division of the Plaintiff's Recovery

The second issue concerns the allocation of expected liability among litigating defendants. From this perspective, joint and several liability performs badly: it places a disproportionate burden on the defendant with the smaller share of the liability, except when the plaintiff's probabilities of success are perfectly correlated. Consider an example in which, instead of being equally at fault, Row and Column are 25 percent and 75 percent at fault, respectively; the plaintiff's probabilities of prevailing against each of the defendants remains at 50 percent and these probabilities are independent. There are then four possible scenarios, each carrying a probability of 25 percent:

1. the plaintiff prevails against both defendants and collects $25 from Row and $75 from Column;
2. the plaintiff prevails against Row and loses to Column, and collects $100 from Row;

3. the plaintiff loses to Row and prevails against Column, and collects $100 from Column; and
4. the plaintiff loses to both defendants and does not recover anything.

Thus, Row pays $25 with probability 25 percent and $100 with probability 25 percent; her expected liability is then $31.25. In turn, Column pays $75 with probability 25 percent and $100 with probability 25 percent, and her expected liability is $42.75. Thus, while Row's contribution to the harm is only one-third that of Column's, her expected liability is about three-quarters that of Column's.

The preceding example shows that this disproportionate effect stems exclusively from the fact that under joint and several liability the plaintiff might prevail against the defendant with the lower responsibility for the harm but lose against the other defendant, and that the defendant with the lower responsibility is then required to pay the plaintiff's full damages. In contrast, under non-joint liability (and under joint and several liability when the plaintiff's probabilities of success are perfectly correlated), each defendant's expected liability is proportional to its responsibility for the harm.

13. The Effects of Settlements

The possibility of settlements introduces a third fairness issue, also by placing a disproportionate burden on the defendant with the smaller share of the liability. Indeed, for the legal regime analyzed in Part C, which employs a pro tanto set-off rule, each defendant settles for the same amount, even when their shares of the harm are different. Consider the example in which the litigation costs are sufficiently high that they induce the parties to settle, and in which the plaintiff makes take-it-or-leave-it offers to the defendants.

The largest settlement that Row will accept, S_R, conditional on Column settling for S_C (which is less than the plaintiff's damages D) is given by

$$S_R = p(D - S_C) + t \tag{1}$$

where p is the plaintiff's probability of success against each defendant, t is each defendant's litigation costs, and D are the plaintiff's damages. Similarly, the largest settlement that Row will accept, S_C, conditional on Column settling for S_R (which is less than the plaintiff's damages D) is given by

$$S_C = p(D - S_R) + t \tag{2}$$

Thus,

$$S_R = S_C = (Dp + t)/(1 + p) \tag{3}$$

As a result, when litigation costs are sufficiently high that the parties settle despite the independence of the plaintiff's probabilities of success, the plaintiff

extracts from each defendant an equal settlement, regardless of the differences in the defendants' shares of the harm.

In contrast, recall that under non-joint liability, each defendant's expected liability is proportional to its responsibility for the harm. The plaintiff, if she made take-it-or-leave-it offers, could extract from each defendant in settlement this amount plus the defendant's litigation costs. If each defendant's litigation costs are independent of their share of the liability, the defendant with the smaller share will pay a disproportionate amount, but it will be less disproportionate than what she would have paid under joint and several liability.

14. Division of the Burden of Insolvency

The fourth fairness issue arises if one of the defendants has limited solvency. Our assessment of fairness here is neither fully *ex ante* nor fully *ex post*. A fully *ex ante* perspective would consider the likelihood that each defendant would become insolvent; instead our discussion assumes that one defendant is already insolvent. On the other hand, our discussion is not fully *ex post* because we assess fairness in terms of expected litigation (and settlement) outcomes.

We have studied elsewhere how the shortfall caused by the limited solvency of one defendant is allocated between the plaintiff and the remaining solvent defendant under joint and several liability (Kornhauser and Revesz, 1994b). That study revealed that, over a broad range of solvencies, the plaintiff bears the full shortfall, and it is never the case that the full shortfall is borne by the solvent defendant. This conclusion challenges the accepted wisdom that, under joint and several liability, the burden of one defendant's insolvency falls exclusively on its co-defendants (Sugarman, 1992).

The reason for the entrenchment of this erroneous view may be that judges and commentators implicitly consider only the situation in which the plaintiff's probabilities of success are perfectly correlated and the plaintiff litigates against both defendants. Then, any shortfall caused by one defendant's limited solvency is borne by the other defendant. If, however, the correlation of the probabilities is less than perfect, the plaintiff's expected recovery is reduced because it might prevail only against the defendant with limited solvency. Moreover, the focus on litigation overlooks the fact that settlement might occur.

Thus, under joint and several liability the shortfall caused by one defendant's limited solvency is generally shared between the solvent defendant and the plaintiff. In contrast, as shown in Part C, under non-joint liability, the full shortfall is borne by the plaintiff.

In summary, joint and several liability performs worse in terms of fairly allocating liability among defendants but does not necessarily perform worse in terms of fairly allocating liability between the plaintiff on the one hand, and the defendants on the other.

15. Conclusions

In sum, from the perspectives of inducing deterrence and inducing settlements, and promoting fairness, there is no dominant relationship between joint and several liability and non-joint liability. From a deterrence perspective, the comparison between the two rules turns on the levels of solvency of the defendants. In contrast, from settlement and fairness perspectives, the comparison turns on the correlation of the plaintiff's probabilities of success against the defendants.

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