MULTIDEFENDANT SETTLEMENTS: THE IMPACT OF JOINT AND SEVERAL LIABILITY

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This article extends the economic analysis of settlements to problems involving multiple defendants. The law and economics literature on settlements has focused almost exclusively on the case of a single plaintiff settling with a single defendant and has paid little attention to the game-theoretic issues that arise where there are multiple defendants.1 Though

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In a recent paper, Jeffrey Lange studies, in a multiple-defendant context, possible contractual arrangements between a plaintiff and one or more defendants. Jeffrey Lange, Litigation Risk Exchange: An Economic Analysis of Sliding-Scale Settlements (unpublished manuscript, Univ. Pennsylvania Law School 1993). He addresses only the case of perfectly

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the analysis of settlements between a single plaintiff and a single defendant extends to the case of a single plaintiff facing multiple defendants under a rule of nonjoint (several only) liability, the analysis differs greatly when one considers a regime of joint and several liability. Most important, the effect of joint and several liability on settlements depends on the extent to which the plaintiff’s probabilities of success in litigation are correlated across the defendants. When the plaintiff’s probabilities of success are sufficiently independent, joint and several liability encourages settlements; in contrast, when they are highly correlated, joint and several liability encourages settlements.

Our conclusion that, under broad sets of circumstances, joint and several liability discourages settlements is at odds with the view that we believe prevails in the legal community: that because joint and several liability treats defendants more harshly, it makes them more willing to settle. This view ignores that plaintiffs, in turn, demand larger settle-

correlated probabilities. See id. Our article does not contemplate the possibility of such agreements.

For a recent work on settlements in litigation involving multiple, sequential plaintiffs, see Yeon Koo Che & Jong Goo Yi, Litigations with Multiple Plaintiffs: The Case of Effort Externality (Publication No. 200, Stanford Univ., Center for Economic Policy Research, April 1990). This article focuses on the incentives to expend effort that would be useful to subsequent plaintiffs. Our article, instead, focuses on the noncooperative game faced by multiple defendants in the face of a simultaneous offer of settlement by a single plaintiff.


During the 1985 hearings concerning the reauthorization of the Superfund statute, the administration argued vigorously that joint and several liability would promote settlements because of its tough treatment of defendants who choose to litigate. See, for example, Superfund Reauthorization: Judicial and Legal Issues, Oversight Hearings before the Subcommittee on Administrative Law and Government Relations, Committee on the Judiciary, U.S. House of Representatives, 99th Cong., 1st Sess., at 5–6 (July 17–18, 1985) (statement
ments and, more important, overlooks the complex game-theoretic problem posed by joint and several liability.

Section I first sets forth a simple model in which the plaintiff’s probabilities of success in litigating against two defendants are uncorrelated and in which litigation costs are zero. It shows that, under joint and several liability, the plaintiff will always litigate against both defendants, whereas under nonjoint (several only) liability, the plaintiff would be indifferent between settling and litigating. Then it studies the case of perfectly correlated probabilities, also for zero litigation costs. In this case, joint and several liability actually encourages settlements.

Section II extends this model to deal with positive litigation costs and partially correlated probabilities of success in litigation. The results are presented in Section III, which shows that there is a range of litigation costs and of correlation of probabilities for which joint and several liability leads to litigation with both defendants. Under nonjoint liability, in contrast, the defendants would settle whenever litigation costs are positive. A conclusion is presented in Section IV.

I. Analysis of Settlement Decisions under Uncorrelated Probabilities and Zero Litigation Costs

In this section, we first discuss the traditional models of settlement involving one defendant. We then show that the results of the one-defendant problem extend to settlement with multiple defendants under nonjoint (several only) liability. Next, we set forth the basic assumptions of our model of joint and several liability in the context of two simplifications: that litigation costs are zero and that the plaintiff’s probabilities of prevailing against the defendants are uncorrelated. We establish that, for these conditions, joint and several liability discourages settlements. This conclusion holds for a wide variety of different formulations of the legal regime governing joint and several liability.

A. The Traditional One-Defendant Model

The simplest model of the choice between settlement and litigation considers a plaintiff and a single defendant with complete information of their respective strategic situations. Specifically, each party knows both

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of Lee Thomas, Administrator of Environmental Protection Agency (EPA)), id. at 45 (statement of F. Henry Habicht, II, Assistant Attorney General, Land and Natural Resources Division); Superfund Improvement Act of 1985, Hearings before the Committee on the Judiciary on S. 51, U.S. Senate, 99th Cong., 1st Sess., at 18, 22 (June 7 and 10, 1985) (statement of Lee Thomas).

its own and the other party’s belief about the plaintiff’s probability of success at trial and the value of the litigation, as well as the litigation costs faced by each.  

In this model, if both parties are risk-neutral, have common beliefs about the prospect and value of success at trial, and face zero litigation costs, each is indifferent between litigation and settlement for the expected value of the litigation. This model leads to the following conclusions: (1) parties that face positive litigation costs (but are risk-neutral and have common beliefs) will settle and divide the “surplus” of avoided costs of litigation, (2) parties that are risk-averse (but face no litigation costs and share common beliefs) will settle to avoid the risk of litigation, and (3) risk-neutral parties that face zero litigation costs will settle when at least one has pessimistic beliefs and none has optimistic beliefs about the prospects or value of success at trial.  

Alternatively, if one assumes, as we do in our formal model, that when the parties are indifferent between settlement and litigation they choose to settle, the single-defendant model produces settlements even if litigation costs are zero, the parties are risk-neutral, and they share common beliefs.

B. Settlement under Nonjoint (Several Only) Liability

The results of the one-defendant problem extend directly to settlement with multiple defendants under nonjoint (several only) liability. Under nonjoint liability, the plaintiff’s claim against each of the defendants is equal to that defendant’s apportioned share of the liability. This claim is not affected by whether the plaintiff litigates or settles with the other

6 This paragraph describes the models of Gould, Landes, and Posner, all cited supra note 1. These authors do not explicitly frame their analysis in game-theoretic terms. Subsequent analyses of the settlement game between a single plaintiff and a single defendant have been framed explicitly in game-theoretic terms but consider much more complex strategic situations in which there is either asymmetric information or symmetric but incomplete (or imperfect) information. See Lucian Bebchuk, Litigation and Settlement under Imperfect Information, 15 RAND J. Econ. 404 (1984); Barry Nalebuff, Credible Pre-trial Negotiation, 18 RAND J. Econ. 198 (1987).

7 A plaintiff has pessimistic beliefs when it believes that its own prospects of success are less than its true prospects of success, while a defendant has pessimistic beliefs when it believes that the plaintiff’s prospects of success are greater than plaintiff’s true prospects of success.

There is an alternative definition of pessimism and optimism, which does not depend on a comparison to objective probabilities of success but instead relies on the relative assessments of the parties. The beliefs of the parties are pessimistic when a plaintiff believes that her probability of success is lower than the defendant’s belief of the plaintiff’s probability of success. Conversely, the beliefs of the parties are optimistic when a plaintiff believes that her probability of success is higher than the defendant’s belief of the plaintiff’s probability of success.
defendants or, in the latter case, by the amount of the settlement. So, the plaintiff faces the one-defendant problem against each of the defendants.

Thus, if the plaintiff and a defendant are risk-neutral, share common beliefs about the plaintiff’s probability of success, and if litigation costs are zero, the two parties will be indifferent between settling and litigating; this conclusion is independent of the plaintiff’s probabilities of success, the correlation of these probabilities, or the defendants’ share of the liability. Similarly, the analysis for risk aversion, pessimistic beliefs, and positive litigation costs is identical to that in the one-defendant problem.

C. The Basic Assumptions of Our Model of Settlement under Joint and Several Liability

We consider in this section a regime of joint and several liability with contribution in which a single plaintiff has a claim against two defendants, Row and Column. We assume that the parties are risk-neutral and that the defendants are infinitely solvent.

If the plaintiff is successful in its litigation against both defendants, the damages are apportioned between Row and Column according to their relative shares of the liability. This rule is consistent with the approach of the Uniform Comparative Fault Act (UCFA). Technically, under joint and several liability, the plaintiff can recover its full damages from either of the defendants, and the defendant that must satisfy the judgment has the burden of bringing a contribution action against the other. The simplification that we make has little analytic consequence as long as the contribution action is litigated at the same time as the plaintiff’s claim.

8 A potential complication arises in the case of high litigation costs. If the plaintiff were to settle with one defendant and recover from the other that defendant’s apportioned share, its total recovery might be greater than its damages, because the amount of the settlement would reflect the savings from forgoing litigation. The courts, however, have generally allowed such outcomes, on the ground that the plaintiff, rather than the nonsettling defendant, should benefit from an advantageous settlement. See, for example, Roland v. Bernstein, 828 P.2d 1237 (Ariz. Ct. App. 1991); Stratton v. Parker, 793 S.W.2d 817 (Ky. 1990); Glenn v. Fleming, 732 P.2d 750 (Kan. 1987); Wilson v. Galt, 668 P.2d 1104, 1107–10 (N.M. Ct. App. 1983), cert. quashed, 668 P.2d 308 (N.M. 1983). Thus, even in these cases, the plaintiff’s claims against the defendants are independent. For discussion of a hypothetical one-satisfaction version of nonjoint liability, see Section IIIId infra.

9 Under nonjoint liability, the plaintiff’s expected recovery from litigation is independent of the correlation of probabilities. See note 69 infra.


12 Otherwise, it might have an effect on the expenditure of litigation costs by the various parties.
We assume that Row’s share of the liability is \( r \) and Column’s is \( (1 - r) \). Without loss of generality, we may (1) assume \( r \leq 1/2 \) (if the defendants have unequal shares of liability, Row’s is the smaller one) and (2) normalize the value of the successful claim to 1.

We assume that the probability that the plaintiff will prevail against each defendant is \( p \), where \( 0 < p < 1 \). In this section, we assume that the plaintiff’s probabilities of success are uncorrelated. Thus, for example, the plaintiff’s probability of success against Column is \( p \) regardless of whether the plaintiff has prevailed against, lost to, or settled with Row. We assume that all the parties know the value of \( p \); thus, we do not address the problem of imperfect information.

The parties may either litigate (\(-s\)) or settle (\(s\)) 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. We assume that costs of coordinating their actions are sufficiently high that they act noncooperatively. The

\[\text{13 We assume that the plaintiff faces the same probability of success with respect to the two defendants. This assumption merely simplifies the analysis; it does not affect any of the results.}\]

\[\text{14 Noncooperative games are ones in which the parties are not able to coordinate their strategies through binding agreements. The analysis of a noncooperative game requires stating the strategies available to each player and, for every possible combination of chosen strategies, the payoff to each player. The solution to the game embodies a conception of rational action for the players—how each party best protects or promotes her interests given the strategic structure of the interaction. We shall identify the Nash equilibria of the settlement game, the standard solution concept in noncooperative game theory.}\]

Noncooperative game theory can also be used to analyze contracts between noncooperating parties. Such games, however, model contracts as a sequence of individual moves: at time \( t \), one act available to party A is to make an offer; at time \( t + 1 \), if party A has made an offer, one act available to party B is to accept the offer; at time \( t + 2 \), if party B has accepted an offer, one act available to party A is to perform her contract (and another act is not to perform); at time \( t + 3 \), in the event of nonperformance, one act available to party B is to file a complaint; and so on. This game will remain noncooperative if the parties cannot make binding agreements to coordinate their strategies. A strategy is a complete plan of action for a player; that is, a strategy plans an action for every contingency that the player may face.

At first glance it might seem odd that the defendants would not be able to enter into agreements to coordinate their actions but would nonetheless be able to enter into settlements with the plaintiff. Such agreements among defendants, however, do not appear common. Indeed, although defendants in multiparty cases sometimes retain a common representation, they do not relinquish to this representative the authority whether to enter into settlements. Thus, such arrangements do not give rise to cooperative games. We have completed an empirical study of CERCLA settlements, which reveals many examples in which some defendants settle and others litigate. See Lewis A. Kornhauser & Richard L. Revesz, De Minimis Settlements under Superfund (final report to the Administrative Conference of the United States, November 1992). An assumption similar to ours is made in Easterbrook, Landes, & Posner, supra note 1, at 359–60, 365–66, and Polinsky & Shavell, supra note 1, at 458–59.
plaintiff then litigates against the nonsettling defendants, if any. We adopt the convention that, if a defendant is indifferent between settlement and litigation, it settles.

The legal regime governing settlements under joint and several liability can be defined by reference to four principal elements. For each of these elements, the legal regime offers various alternative rules. We indicate the rule embodied in our model, as well as the leading alternatives. Throughout the article, we make reference to these alternatives as a means of assessing the generality of our results.

First, how does the plaintiff’s settlement with one defendant affect the liability of the nonsettling defendant? In our model, if only one defendant accepts the settlement offer, the value of the plaintiff’s claim against the other defendant is reduced by the amount of the settlement (a pro tanto setoff rule). Thus, to the extent that the plaintiff settles with one defendant for less than this party’s proportional share of liability, and then prevails in its litigation against the nonsettling defendant, the latter will bear more than its apportioned share of liability. This rule is based on the Uniform Contribution among Tortfeasors Act (UCATA).

In contrast, the UCFA provides that the plaintiff’s claim against a nonsettling defendant is reduced by the settling defendant’s apportioned share of the liability. This apportioned setoff rule has two formulations, which differ by reference to the treatment of the plaintiff’s claim against the nonsettling defendant when its settlement with the other defendant is for more than that defendant’s apportioned share of the liability. Under the unconstrained version, the plaintiff’s claim is reduced only by the settling defendant’s apportioned share of the liability, even though its total recovery if it prevails in litigation would then be greater than its damages. Under the constrained version, the plaintiff’s claim against the nonsettling defendant is reduced by the greater of (1) the settlement and (2) the settling defendant’s apportioned share.

Our article shows that, in the context of joint and several liability, there are large incentives for agreements among defendants. That such agreements appear not to be common suggests that the corresponding litigation costs are, indeed, high.

15 For a somewhat different taxonomy, see Easterbrook, Landes, & Posner, supra note 1, at 334–35 n.11.
16 See section 4(a).
18 The unconstrained version appears prevalent. See, for example, Rambaum v. Swisher, 435 N.W.2d 19 (Minn. 1989); Thomas v. Solberg, 442 N.W.2d 73 (Iowa 1989); Austin v.
Second, can a settling defendant be sued for contribution by the other defendants? In our model, when a defendant settles, it obtains protection from contribution actions. This rule is consistent with both the UCFA and UCATA. Thus, if a defendant settles for less than its apportioned share of liability and the plaintiff litigates against the other defendant and recovers more than that defendant’s apportioned share of the liability, the settling defendant will nonetheless not be subject to a contribution action. An alternative rule would allow actions for contribution in such cases.

Third, can a settling defendant obtain contribution from other defendants? In our model, such contribution actions are not allowed. Under both the UCFA and UCATA, a settling defendant can seek such contribution only to the extent that the plaintiff’s claim against the other defendants is extinguished by the settlement. Our analysis shows, however, that, except in the case of very high transaction costs, it is not in the plaintiff’s interest to settle with one defendant in a manner that extinguishes the liability of the other, and that when litigation costs are high, it is not in the settling defendant’s interest to pursue the contribution action. Thus, while our assumption increases the tractability of the analysis, it leads to the same results as modeling the actual UCFA and UCATA rules. An alternative rule would allow a settling defendant to bring a contribution action even when the settlement did not extinguish the plaintiff’s claim against the other defendants.

Fourth, are there any constraints on the types of settlement offers that the plaintiff can make? Our model does not constrain the plaintiff’s choice of settlement offers, although we assume that the plaintiff cannot make settlement offers that are effective only if both defendants accept


19 See section 6.
20 See section 4(b).
21 This term, the Supreme Court granted certiorari to resolve this issue under the federal common law of admiralty. See Boca Grande Club, Inc. v. Polackwick, 990 F.2d 606 (11th Cir.), cert. granted sub nom. Boca Grande Club, Inc. v. Florida Power & Light Co., 114 S. Ct. 39 (1993).
22 Section 4(b).
23 Section 1(d).
24 See note 53 infra.
them.\textsuperscript{25} An alternative would require that the settlement offers be proportional to the defendant’s share of the liability—an equal treatment requirement.

The set of rules modeled in this article is informed by the legal regime of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund), as amended by the Superfund Amendment and Reauthorization Act of 1986 (SARA).\textsuperscript{26} CERCLA imposes joint and several liability on responsible parties (generators and transporters of hazardous wastes, and owners and certain prior owners of hazardous waste sites), but defendants held jointly and severally liable can bring actions for contribution against other responsible parties.\textsuperscript{27} CERCLA provides for pro tanto setoff in the event of partial settlements and establishes that settling parties are protected from contribution actions.\textsuperscript{28}

There are, however, two differences between the legal rules in our model and those in CERCLA. Under CERCLA, unlike under the UCFA and UCATA, a settling defendant can seek contribution from a nonsettling defendant even if the settlement does not extinguish that defendant’s liability.\textsuperscript{29} Moreover, at least in the case of settlements with defendants


In general, courts can entertain a nonsettling defendant’s challenge to a settlement on the ground that it was not entered in “good faith.” In Tech-Bilt, Inc. v. Woodward-Clyde & Assoc., 698 P.2d 159 (Calif. 1985), the court held that the good-faith inquiry “would enable the trial court to inquire, among other things, whether the amount of the settlement is within the reasonable range of the settling tortfeasor’s proportional share of comparative liability for the plaintiff’s injuries.” Id. at 166. In a strong dissent, Chief Justice Bird argued that “a settlement satisfies the good faith requirement if it is free of corrupt intent, that is, free of intent to injure the interests of the nonsettling tortfeasors. A settlement is made in bad faith only if it is collusive, fraudulent, dishonest, or involves tortious conduct.” Id. at 168 (Bird, C.J., dissenting). Under her approach, the actual amount of the settlement would not be relevant to the good-faith inquiry.

Approaches similar to that of \textit{Tech-Bilt} have been adopted in other jurisdictions. See, for example, International Action Sports, Inc. v. Sabellisco, 573 So. 2d 928 (Fla. Dist. Ct. App.), review denied, 583 So. 2d 1036 (Fla. 1991); Picket v. Stephens-Nielsen, Inc., 717 P.2d 277 (Wash. App. Ct. 1986). Several jurisdictions, however, have rejected the \textit{Tech-Bilt} approach and sided with Chief Justice Bird. See, for example, Noyes v. Raymond, 548 N.E.2d 196 (Mass. App. Ct. 1990). Other courts have held that the \textit{Tech-Bilt} inquiry is not required and have given the trial courts broad discretion to determine the factors that are relevant to the good-faith inquiry. See, for example, Velsicol Chemical Corp. v. Davidson, 811 P.2d 561 (Nev. 1991).

\textsuperscript{26} 42 U.S.C. § 9601 et seq.
\textsuperscript{27} Id. at § 9613(f)(1).
\textsuperscript{28} Id. at § 9613(f)(2).
\textsuperscript{29} Id. at § 9613(f)(3)(B).
that bear a small proportion of the liability, the Environmental Protection Agency’s settlement offers are generally proportional to a defendant’s volumetric contribution.30

D. Conditions under Which Joint and Several Liability Discourages Settlements

In this section, we demonstrate that, when a plaintiff faces multiple defendants subject to a rule of joint and several liability, and the probability of prevailing against each defendant is independent of the probability of prevailing against the other (that is, the probabilities are uncorrelated), the structure of choice between settlement and litigation differs in important ways from the simple one-defendant model. As indicated in the preceding section, our discussion focuses on the case of zero litigation costs, uncorrelated probabilities of success for the plaintiff, risk neutrality of all parties, and common beliefs in the prospects and value of success at trial. Under these circumstances, we show that settlement will never occur. The plaintiff will strictly prefer to litigate against both defendants rather than offer terms acceptable to one or both defendants.

Joint and several liability improves the plaintiff’s prospects of recovery; it needs to prevail against only one of the defendants to recover fully. If the plaintiff faces only one defendant, its expected recovery from litigation is simply the probability of prevailing times the recovery in the event that it prevails: under the notation of our model (with damages normalized to 1), the expected recovery is simply $p$. Similarly, in the case of two defendants, if liability were nonjoint, the plaintiff’s expected recovery from Row would be $rp$ and from Column $(1 - r)p$ for the identical total expected recovery of $p$.

Under joint and several liability, in contrast, if the plaintiff litigates against both defendants, it recovers its full damages under three different scenarios: with probability $p^2$ if it prevails against both defendants; with probability $p(1 - p)$ if it prevails only against Row; and, similarly, with probability $p(1 - p)$ if it prevails only against Column. Let $V(\neg s, \neg s)$ be the expected value of the litigation; then

$$V(\neg s, \neg s) = [p^2 + 2p(1 - p)] = p(2 - p) = V. \quad (1)$$

30 See Kornhauser & Revesz, supra note 14. We believe that the agency faces such a constraint as a result of representations it made in response to concerns, expressed at the time of the passage of CERCLA, about the potential unfairness that results from joint and several liability. See, for example, Superfund Reauthorization, supra note 4, at 953–54 (statement of Edmund Frost on behalf of the Chemical Manufacturers Ass’n). For the Administration’s assurances, see, for example, id. at 14–15 (statement of Lee Thomas, Administrator of EPA), id. at 44–46 (statement of F. Henry Habicht, II).
This expected value is higher than the expected value of litigation in the one-actor problem for any $p$, such that $0 < p < 1$.

Any settlement must be acceptable to the plaintiff and to any settling defendant. A settlement is acceptable to the plaintiff if and only if its expected return from the settlement and any attendant litigation at least equals its expected return from litigation against both defendants. We must show that the plaintiff cannot recover at least $V$ either by settling with both defendants or by settling with one and litigating with the other.

First, in equilibrium, there is no settlement with both defendants of the form $(S, V - S)$, in which Row pays $S$ and Column pays $(V - S)$, so that the plaintiff recovers $V$. It follows logically that if the plaintiff cannot recover $V$, it cannot recover larger amounts either.\(^{31}\)

Suppose that Row settles for $S$. Then, Column accepts the settlement offer of $(V - S)$ if and only if this amount is no greater than its expected loss if it chooses to litigate. Thus, Column accepts the settlement if and only if

$$V - S = p(2 - p) - S \leq p(1 - S). \tag{2}$$

Equation (2) simplifies to $S \geq p$. It follows that for $S < p$, Column prefers to litigate than to accept the plaintiff’s offer of $(V - S)$.

Now suppose that $S \geq p$. As (2) shows, Column now prefers to settle rather than litigate conditional on Row settling. For $(S, V - S)$ to be an equilibrium, however, also requires that, conditional on Column settling for $(V - S)$, Row chooses to settle for $S$. By an argument analogous to that about Column, we see that Row accepts such a settlement if and only if

$$S \leq p[1 - (V - S)]. \tag{3}$$

Equation (3) simplifies to $S \leq p(1 - p) < p$. Thus, $S \geq p$ is a sufficient condition for ensuring that, conditional on Column settling, Row chooses to litigate.

Consequently, the plaintiff knows that any pair of offers $(S, V - S)$ induces at most one defendant to settle and that its expected recovery from a settlement with this defendant and the litigation with the other is less than $V$, its expected recovery from litigation against both defendants. Therefore, the plaintiff never makes the pair of offers $(S, V - S)$.\(^{32}\)

We show, next, that the plaintiff does not settle with one defendant and litigate against the other. We now know that the plaintiff chooses to litigate against at least one defendant. From the litigating defendant, the

\(^{31}\) Consider a pair of offers $(\sigma_R, \sigma_C)$, with $\sigma_R + \sigma_C > V$. If both defendants will not settle for either $(\sigma_R, V - \sigma_R)$ or $(V - \sigma_C, \sigma_C)$, then clearly both will not settle for $(\sigma_R, \sigma_C)$.

\(^{32}\) This argument is independent of the size of $r$. 

plaintiff expects a recovery of \( p(1 - S) \), where \( S \) is the settlement received from the settling defendant. For this settlement to be acceptable to the settling defendant, say Row, \( S \) must be no greater than the expected loss to Row of litigating, conditional on Column litigating, or

\[
S \leq p[pr + (1 - p)] = S_R. \tag{4}
\]

That is, Row faces a probability \( p \) of losing the litigation; if it loses, with probability \( p \), Column also loses and Row pays its share of \( r \), but with probability \( (1 - p) \), Column prevails and Row has to pay the full damages of 1.

In turn, for \( S \) to be acceptable to the plaintiff it must be the case that

\[
S + p(1 - S) \geq V = p(2 - p). \tag{5}
\]

Thus,

\[
S \geq p = S_P. \tag{6}
\]

But, because \( S_R < S_P \), there is no settlement amount \( S \) that is mutually acceptable to the plaintiff and to Row.

The situation is no different if the plaintiff seeks to induce Row to litigate and Column to settle. In this case Column accepts an offer \( S \) only if

\[
S \leq p[(1 - r) + (1 - p)] = S_C. \tag{7}
\]

Again, \( S_C < S_P \). Thus, in this case, there is no settlement amount \( S \) that is mutually acceptable to the plaintiff and to Column. It follows that the plaintiff never settles with even one defendant.\(^{33}\)

The intuition behind the result that the plaintiff litigates against both defendants is relatively straightforward. It stems both from the surplus that the plaintiff obtains by litigating against both defendants under joint and several liability and from the setoff that a nonsettling defendant receives when the plaintiff settles with the other defendant.

\(^{33}\) If, for some reason, the plaintiff were to make settlement offers to the defendants, the offers would be of the form \( (S_1, S_2) \), where \( S_1 > S_R \) and \( S_2 > S_C \). If the plaintiff were to make a lower settlement offer to one of the defendants, that defendant would accept the offer, and the plaintiff’s total recovery (the settlement plus the expected value of the litigation against the other defendant) would be less than \( V \), the value of litigating against both defendants. This result follows even if the two settlement offers added to more than \( V \). Note, moreover, that \( S_1 + S_2 > S_R + S_C = V \). Thus, the total amount of the settlement offers that the plaintiff has to make to ensure that they are rejected is larger than \( V \).

Of course, there is little reason for the plaintiff even to make settlement offers, because any settlements that are advantageous to it would be rejected by both defendants, and any settlements that are accepted by at least one of the defendants would be less desirable for the plaintiff than litigating against both defendants.
As a result of the surplus, the plaintiff does not accept from one defendant a settlement that is too low, even if it chooses to litigate against the other defendant. In the extreme case in which the plaintiff settles with one defendant for zero (or an infinitesimally small amount), it loses the full benefit of joint and several liability. It then faces the same expected payoff as in the one-defendant problem or as in the two-defendant problem under nonjoint liability.

At the same time, one defendant’s decision to settle has an effect on the other defendant. Say, for example, that Row settles and Column litigates. If Row’s settlement is low, Column’s expected liability is higher than if Row had litigated. In contrast, if Row’s settlement is high, Column’s expected liability is lower than if Row had litigated. Because of the surplus generated by joint and several liability, the plaintiff will not settle with Row unless the amount is sufficiently high that Column’s expected liability will be lower than if Row had not settled.34

Moreover, the maximum settlement that Column would be willing to pay is equal to the expected liability that it would face if it litigated. As a result, Row’s decision to settle for an amount that is sufficiently attractive for the plaintiff to accept reduces the maximum settlement that Column would be willing to offer.

In sum, the plaintiff cannot capture the full surplus of Row’s settlement. Instead, part of it accrues to Column.35 As a result of this externality, each defendant will be willing to settle only for amounts that sum to less than the plaintiff can expect through litigation against both.

34 If the plaintiff settles with Row and litigates with Column, its expected recovery is $S + p(1 - S)$, where $S$ is the amount of the settlement. The plaintiff will enter into such a settlement if and only if this recovery is no smaller than the expected recovery of litigating against both defendants, that is, if and only if

$$S + p(1 - S) \geq p(2 - p).$$

This condition holds only for $S \geq p$. Column’s expected liability is then no greater than $p(1 - p)$—less than its expected liability if Row had litigated. See note 35 infra.

35 The benefit that accrues to the nonsettling defendant can be defined more formally. Column’s expected cost of litigation given that Row litigates is $p[p(1 - r) + (1 - p)]$. Column’s expected cost of litigation given that Row settles is $p(1 - S)$. Column will get a benefit from Row’s decision to settle if

$$p(1 - S) < p[p(1 - r) + (1 - p)].$$

This relationship will hold for

$$S > pr = S_N.$$

But $S_N$ is the amount that the plaintiff would recover in a settlement with Row under nonjoint liability and, not surprisingly, is less than the minimum settlement $S_p$ that the plaintiff would be willing to accept under joint and several liability. For any settlement by Row for an amount higher than $S_N$, Column receives an external benefit from the settlement.
We have thus defined a set of conditions under which joint and several liability discourages settlements. This result is quite general. Indeed, several of the assumptions made in the preceding section can be relaxed without affecting the conclusion.

First, the result that joint and several liability discourages settlements does not depend on the pro tanto setoff rule used to reduce the plaintiff’s claim against the nonsettling defendant following a settlement with the other defendant. The structure of our argument is identical for the apportioned setoff rule. The maximum settlement that Row will pay given that Column settles is \( pr \). Similarly, the maximum settlement that Column will pay given that Row settles is \( p(1 - r) \). The plaintiff’s total recovery is \( p \), which is less than the expected value of litigating with both defendants. An argument similar to that presented in equations (4)–(7) establishes that the plaintiff will not settle with one defendant and litigate against the other. For the apportioned setoff rule, as for the pro tanto setoff rule, a settlement offer by one defendant that is sufficiently attractive for the plaintiff to accept reduces the expected cost of litigation of the other defendant.

Second, our result is not affected by relaxing the assumption that a settling defendant is immune from contribution actions. If the maximum settlement that a defendant is willing to pay when it is protected from contribution actions is less than the plaintiff would accept, it follows, a fortiori, that there is no mutually advantageous settlement when the settling defendant might also be liable to the nonsettling defendant for contribution.

36 The result does not extend, however, to a legal regime under which there is no setoff whatsoever. Under such conditions, the plaintiff can induce both defendants to settle. In fact, the plaintiff would be able to extract settlements of \( p \) from each defendant. Its total recovery would be \( 2p > V(\neg s, \neg s) = p(2 - p) \).

More generally, consider a hypothetical setoff rule, under which if the plaintiff settles with one defendant for \( S \), its claim against the other defendant is reduced by \( aS \). Following the approach in eqn. (2) and (3), it is relatively easy to show that the plaintiff will settle with both defendants if and only if \( a \leq 1/(2 - p) < 1 \). By reducing in this way the benefit that one defendant receives from a settlement by the other that is sufficiently high for the plaintiff to accept, the externality that precludes the entry of settlements is eliminated.

37 Because this amount is smaller than Row’s apportioned share, the unconstrained and constrained versions of the rule yield the same results.

38 Column’s expected cost of litigation given that Row litigates is \( p[p(1 - r) + (1 - p)] \). Column’s expected cost of litigation given that Row settles is \( p(1 - r) \). Column will get a benefit from Row’s decision to settle if

\[
p(1 - r) < p[p(1 - r) + (1 - p)].
\]

This relationship always holds for \( 0 < p < 1 \).
Third, our conclusion that joint and several liability discourages settlements is not dependent on the assumption that a settling defendant cannot seek contribution. We consider first the rule under which a defendant can seek contribution only if it extinguishes the plaintiff’s claim. The plaintiff will agree to a settlement that extinguishes its claim if the amount is at least equal to $V$, the expected value of litigating against both defendants. A defendant that paid such a settlement and then sought contribution for the other defendant’s apportioned share would end up paying the full surplus that the plaintiff obtains as a result of joint and several liability. In contrast, if both defendants litigate, the surplus is shared. Thus, neither defendant would agree to settle in a manner that extinguishes the plaintiff’s claim.

Next, we consider the option of allowing a defendant to seek contribution even if its settlement does not extinguish the plaintiff’s claim. Equation (7) shows, under a rule in which a settling defendant cannot seek contribution from a nonsettling defendant, that the maximum amount that Column would pay in settlement given that Row litigates, $S_C$, is smaller than Column’s apportioned share of $(1 - r)$.

Column would therefore not be entitled to a contribution action against Row even if the legal regime allowed such actions.

In contrast, equation (4) reveals that, for $r < p/(1 + p)$, $S_R > r$. In such cases, Row’s settlement under a rule that precludes it from seeking contribution is greater than its apportioned share. If it were allowed to seek contribution for the amount by which its settlement exceeds its apportioned share, the expected value of its contribution action would be $p(S - r)$. Thus, it will be willing to settle with the plaintiff for a larger amount, as it will be able to recover part of its settlement for the other defendant. The maximum amount, $S'_R$, that Row would pay is given by

$$S'_R - p(S'_R - r) = p[pr + (1 - p)]. \tag{8}$$

Rearranging the terms,

$$S'_R = p(1 - r). \tag{9}$$

---

39 We assume that the probability that a defendant will prevail in a contribution action is $p$—the same as the plaintiff’s probability of prevailing against a defendant.

40 More generally, this expression may be written as

$$S'_R - \max[p(S'_R - r), 0] = p[pr + (1 - p)].$$

For Column, the corresponding expression is given by

$$S'_C - \max\{p[S'_C - (1 - r)], 0\} = p[p(1 - r) + (1 - p)].$$
Comparing equations (6) and (9) reveals that the maximum settlement that Row would pay continues to be smaller than the minimum settlement that the plaintiff would demand. Thus, allowing a settling defendant to seek contribution does not lead to an outcome in which one defendant settles and the other litigates.

Neither does such a rule lead both defendants to settle. Recall that, absent such contribution actions, in equilibrium there is no settlement with both defendants of the form \((S, V - S)\). Assume now that, with probability \(p\), Row could recover from Column an amount \(a\) in contribution. Row would therefore be willing to pay the plaintiff a higher settlement, but, in contrast, Column would not be willing to pay as much. It follows directly from the preceding analysis that, in equilibrium, there is no settlement of the form \((S + pa, V - S - pa)\), in which the plaintiff settles with both defendants.

Fourth, the impact of joint and several liability would be no different if the plaintiff’s offers were subject to an equal treatment requirement. Such a requirement merely reduces the amount that the plaintiff can recover through settlements and therefore makes settlements even less attractive.

Fifth, the result is also independent of the assumption that the plaintiff moves first and makes a take-it-or-leave-it offer—an assumption that plays a more prominent role in the subsequent sections. If the defendants made take-it-or-leave-it offers, the plaintiff would simply reject them, because its expected payoff from litigating is higher than what it could obtain in settlement.

Sixth, the argument also extends to situations with more than two defendants because the surplus produced by joint and several liability increases with increasing numbers of defendants. Thus, the settlement of one defendant provides an analogous external benefit on all nonsettling defendants.

Seventh, because the plaintiff’s preference for litigation under joint and several liability is strict and smooth, there will be no settlement either when litigation costs are small, probabilities of success slightly correlated, parties marginally risk-averse, or beliefs slightly pessimistic.

Having enumerated a broad set of circumstances under which joint

\[41\] It follows, as before, see text around note 31 supra, that there is no settlement of the form \((\sigma_R, \sigma_C)\), where \(\sigma_R + \sigma_C > V\).

\[42\] For uncorrelated probabilities, the probability of prevailing against at least one defendant when there are three defendants is larger than the probability of prevailing against at least one defendant when there are two defendants. Formally \(1 - (1 - p)^2 - [1 - (1 - p)]^2 = p(1 - p)^2 > 0\) for \(0 < p < 1\). In general, \([1 - (1 - p)^n] - [1 - (1 - p)^{n-1}] = p(1 - p)^{n-1} > 0\) for \(0 < p < 1\).

\[43\] The first two of these situations are analyzed in detail in Sections II and III infra.
and several liability discourages settlement, it is important to state two necessary assumptions. First, our conclusion requires that the defendants act noncooperatively. Otherwise, they could agree to settlements equal to the expected value of litigation and, for zero litigation costs, would be indifferent between settling and litigating. With cooperation, the settlement-inducing effects of joint and several liability are identical to those of nonjoint liability.

Second, our conclusion requires that the plaintiff’s probabilities of success against the defendants be sufficiently uncorrelated. Consider, instead, the case of fully correlated probabilities: with probability \( p \), the plaintiff recovers its full damages of 1, and with probability \( (1 - p) \) it recovers nothing. As a result,

\[
V(\neg s, \neg s) = p. \tag{10}
\]

This problem differs from that discussed in the prior section in two important ways. First, for perfectly correlated probabilities, the plaintiff obtains no surplus when it litigates against two defendants under joint and several liability. As equation (10) indicates, its expected recovery is identical to the expected value of litigation against one defendant, as well as against two defendants under nonjoint liability.

Second, there is no scenario under which settlement with one defendant could reduce the plaintiff’s expected recovery. Indeed, if the plaintiff obtains \( S \) from one defendant, whatever the value of \( S \), the expected value of its claim against the other is reduced by a smaller amount, namely, \( pS \); thus, settling with one defendant creates a surplus for the plaintiff of \( (1 - p)S \).

As a result, it is clear for perfectly correlated probabilities that, whereas under nonjoint liability the plaintiff is indifferent between settling and litigating when litigation costs are zero, under joint and several liability it has a distinct preference to settle with at least one defendant. Whether joint and several liability induces the plaintiff to settle with both defendants is more complicated and is analyzed following the further development of the model.\(^{44}\)

II. A More General Model of Settlement under Joint and Several Liability

A. Additional Assumptions

We now consider the situation in which the plaintiff’s probabilities of success against the defendants are nonnegatively correlated and in which

\(^{44}\) See Section IIIB infra.
the costs of litigation are positive. The game has the same structure as in Section I—the plaintiff makes settlement offers to the two defendants; Row and Column, acting noncooperatively, decide whether to accept these offers, and the plaintiff then litigates against the nonsettling defendants, if any.\textsuperscript{45} Similarly, we model the same legal rules concerning contribution and setoffs.

Suppose that the probability that the plaintiff prevails in litigation against a single defendant is $p$ (regardless of whether Row or Column is the defendant). If the plaintiff prevails against one defendant, we define $\delta p$ to be the probability that it also prevails against the other defendant, where $\delta$ is in the closed interval $[0, 1/p]$. The complete joint probability distribution is then

\begin{align*}
\text{pr}[\text{R loses and C loses}] &= \delta p^2, \\
\text{pr}[\text{R wins and C loses}] &= p(1 - \delta p), \\
\text{pr}[\text{R loses and C wins}] &= p(1 - \delta p), \text{ and} \\
\text{pr}[\text{R wins and C wins}] &= 1 - 2p + \delta p^2.
\end{align*}

Note that $\delta = 1/p$ implies perfect (positive) correlation of the outcome of litigation: the plaintiff either wins against both defendants or loses against both defendants; it cannot prevail against one and lose against

\textsuperscript{45} We model the interaction between the plaintiff and the defendants as a two-stage game. In stage 1, the plaintiff makes simultaneous take-it-or-leave-it offers to the two defendants. In stage 2, each defendant independently decides to accept or to reject the plaintiff’s offer. If both defendants accept the offers, the game ends; if one or more rejects the offers, the plaintiff litigates against those defendants, regardless of the expected value of the litigation, and the game then ends. In this “commitment” model, the plaintiff is able to commit itself at stage 1 to litigation in the event that at least one defendant rejects its offer. Note, however, that under the commitment model, in equilibrium the plaintiff does not litigate cases with negative expected value; the threat of such litigation coupled with its ability to make take-it-or-leave-it offers allows it to extract positive settlements from the defendants.

An alternative model would add a third stage to the analysis. In the third stage, if one or more of the defendants rejected its offer, the plaintiff would litigate only if the expected value of the litigation was positive. In this “no commitment” model, the plaintiff does not commit itself at stage 1 to litigation in the event that its offers are rejected.

If litigation costs are sufficiently low, both models lead to identical results: litigation against the nonsettling defendants will always be desirable to the plaintiff. We show below that, for plausible values of the parameters, the central conclusions of this article are the same under both the commitment and no commitment models. See note 54 infra.

The assumption of take-it-or-leave-it offers also embodies a commitment assumption. It commits the plaintiff to litigate if a defendant rejects a settlement offer, even though the plaintiff might be better off making a second offer for a smaller amount.

The commitment model, coupled with the plaintiff’s take-it-or-leave-it offers, places an upper bound on the settlement range between the plaintiff and the defendants. We could define other bounds using a model of commitment that allowed first Row and then Column to make take-it-or-leave-it offers to the other parties.
the other. In turn, \( \delta = 1 \) implies independence—the condition considered in the prior section. Finally, \( \delta = 0 \) implies perfect negative correlation; the plaintiff always prevails against one, but only one, defendant.\(^46\) It follows that in the range \([0, 1)\), the correlation is negative, whereas in the range \((1, 1/p]\), the correlation is positive. We focus on the latter range.

With respect to the costs of litigation, we assume that each defendant faces a litigation cost of \( t \), where \( t \geq 0 \); this cost is independent of the other defendant’s decision whether or not to settle. We assume that \( t < 1 \)—that is, each party’s litigation costs are smaller than the plaintiff’s total claim against both defendants; to violate this condition, litigation costs would have to be inordinately high.\(^47\)

The plaintiff’s litigation cost is a function of the number of nonsettling defendants: it is \( t \) if only one defendant declines the offer of settlement\(^48\) and \( ut \) if both defendants decline the offer, where \( 1 \leq u \). This assumption excludes the possibility that the total cost of litigation against two defendants is less than the cost of litigation against one. When \( u < 2 \), the plaintiff faces economies of scale in litigation; its total cost of litigation against both defendants is less than the cost of litigating against each separately. When \( u > 2 \), the plaintiff faces diseconomies of scale—perhaps a less plausible condition.

In Section II\( B \), we solve the defendants’ settlement subgame conditional on the plaintiff making a given pair of offers. In Section II\( C \), we determine the plaintiff’s optimal settlement offers for each of the possible equilibria. Applying the results of Section II\( B \) to the plaintiff’s optimal offers determined in Section II\( C \), we identify the subgame perfect equilibrium of the full two-stage game.

**B. The Defendants’ Settlement Game**

Consider a pair of settlement offers \((\sigma_R, \sigma_C)\). One defendant, say Row, will accept \( \sigma_R \) conditional on Column accepting \( \sigma_C \) if and only if

\[
\sigma_R \leq p(1 - \sigma_C) + t \quad \text{for } \sigma_C < 1, \\
= 0 \quad \text{for } \sigma_C \geq 1.
\](11)

\(^46\) Note that \( \delta = 0 \) and the symmetry (with respect to litigation prospects) of Row and Column implies that \( p = 1/2 \).

\(^47\) The significance of this assumption is discussed in note 53 infra.

\(^48\) We thus assume that when the plaintiff litigates against only one defendant, its litigation costs equal those of the defendant. A different assumption merely complicates the algebra.
The right-hand side of the top expression in (11) is the cost to Row of litigating given that Column settles for $\sigma_C$: Row faces a probability $p$ of losing the litigation, and, if it loses, it must pay the total damages of 1 reduced by Column’s settlement of $\sigma_C$; in addition, it must bear its litigation costs $t$. Row will accept a settlement offer that is no more than its cost of litigation.

If the plaintiff’s settlement with Column is for 1 or more, the plaintiff could not recover any further damages from litigation with Row. It is true that, were the plaintiff to sue, the defendant would have to expend $t$ in litigation costs. We assume, however, that in the case of litigation, the defendant could recover its litigation costs through a sanction mechanism such as that provided in federal courts by 28 U.S.C. § 1927, since the only purpose of the judicial proceeding would be to impose litigation costs on the defendant.

Similarly, Column will accept $\sigma_C$ conditional on Row accepting $\sigma_R$ if and only if

$$\sigma_C \leq p(1 - \sigma_R) + t \quad \text{for } \sigma_R < 1,$$
$$= 0 \quad \text{for } \sigma_R \geq 1. \quad (12)$$

Conversely, Row will settle for $\sigma_R$ conditional on Column’s litigating if and only if

$$\sigma_R \leq rp^2 \delta + p(1 - \delta p) + t. \quad (13)$$

Here, the right-hand side is the cost to Row of litigating given that Column litigates: with probability $p^2 \delta$ both defendants lose the litigation, and Row must pay its share $r$ of the total damages of 1; with probability $p(1 - \delta p)$ Row loses but Column prevails, and therefore Row must pay the total damages of 1; in addition, Row must bear its litigation costs $t$. Row will accept a settlement offer that is no more than its expected loss through litigation.

Similarly, Column will settle for $\sigma_C$ conditional on Row litigating if and only if

$$\sigma_C \leq (1 - r)p^2 \delta + p(1 - \delta p) + t. \quad (14)$$

Setting (13) and (14) as equalities, we define the largest settlement $S_i(\delta, t)$ that defendant $i$ will accept conditional on the other defendant litigating:

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49 See Lipsig v. National Student Marketing Corp., 663 F.2d 178, 181 (D.C. Cir. 1980) (per curiam) ("advocacy simply for the sake of burdening an opponent with unnecessary expenditures of time and effort clearly warrants recompense for the extra outlays attributable thereto"). The result would be different if the plaintiff had a valid claim for declaratory judgment.
\[ S_R(\delta, t) = rp^2 \delta + p(1 - \delta p) + t = p + t - \delta p^2(1 - r), \quad (15) \]

and

\[ S_C(\delta, t) = (1 - r)p^2 \delta + p(1 - \delta p) + t = p + t - \delta p^2 r. \quad (16) \]

It is useful to substitute (15) and (16) into (11) and (12) to define \( \Theta_i(\delta, t) \) as \( i \)'s expected loss from litigation conditional on \( j \)'s settling for \( S_j(\delta, t) \). We therefore have

\[
\begin{align*}
\Theta_R(\delta, t) &= p[1 - S_C(\delta, t)] + t = (p + t)(1 - p) + \delta p^3 r & \text{for } S_C < 1 \\
&= 0 & \text{for } S_C \geq 1 \\
\Theta_C(\delta, t) &= p[1 - S_R(\delta, t)] + t = (p + t)(1 - p) + \delta p^3(1 - r) & \text{for } S_R < 1 \\
&= 0 & \text{for } S_R \geq 1
\end{align*}
\]

Equations (11)–(18) will now permit us to determine the plaintiff’s strategy.

C. The Plaintiff’s Strategy

We seek to identify the plaintiff’s optimal offers as a function of \( \delta, p, r, u, \) and \( t \). As a first step, we calculate the plaintiff’s maximum return (and hence its optimal offers) for each of the four possible responses by the defendants. The plaintiff’s expected value \( V_{\delta,t}(\overline{\delta}, \overline{\delta}) \) of litigation against both defendants is easiest to determine because it is independent of the offers plaintiff makes as long as those offers are sufficiently high to induce both defendants to litigate. It is given by

\[ V_{\delta,t}(\overline{\delta}, \overline{\delta}) = p(2 - \delta p) - ut. \quad (19) \]

A set of necessary conditions to induce this outcome is that the plaintiff’s offers \( (\sigma_R, \sigma_C) \) be such that \( \sigma_R > S_R \) and \( \sigma_C > S_C \). These offers guarantee that conditional on one defendant litigating, the other litigates as well. They are not sufficient conditions because they leave open the possibility that both defendants might settle; we turn to this complication shortly.

For each of the other three outcomes, the plaintiff’s return varies with its offers. If the plaintiff settles with only one defendant, its recovery is given by

\[ S + p(1 - S) - t, \]
where $S$ is the amount received from the settling defendant. This expression is maximized when the plaintiff maximizes the settlement received. Equations (15) and (16) show that $S_C$ is greater than $S_R$ except in the case of $r = 1/2$, when they are equal. Thus, except when the defendants are responsible for equal shares of the liability, the plaintiff will never settle with Row and litigate against Column; conditional on settling with only one defendant, the plaintiff will settle with Column.\textsuperscript{50} It then obtains $S_C$ from Column and $(\Theta_R - t)$ from Row and expends $t$ in litigation costs.\textsuperscript{51} Thus,

$$V_{\delta,t}(-s, s) = S_C(\delta, t) + \Theta_R(\delta, t) - 2t$$

$$= p[(2 - p) - (1 - p)\delta pr - t].$$

Equations (15) and (16) show that the plaintiff’s offers ($\sigma_R, \sigma_C$) be such that $\sigma_R > S_R$ and $\sigma_C = S_C$. These offers guarantee that, conditional on Row litigating, Column will settle. They are not sufficient conditions because they leave open the possibility that both defendants might settle. As we show in the footnotes,\textsuperscript{52} this problem can be cured by making $\sigma_R$ sufficiently large.

To calculate the plaintiff’s maximum return from settling with both defendants, we must determine which pair of offers maximizes its return. Let this pair be called $(G_R, G_C)$. Adding equations (11) and (12),

$$V_{b,t}(s, s) = G_R + G_C = 2(p + t)/(1 + p).$$

Substituting back into (11) and (12),

$$G_R = G_C = (p + t)/(1 + p).$$

Equation (21) shows that the maximum amount recovered in settlement is independent of the correlation of probabilities. Equation (22) shows that the amount paid by each of the defendants is independent of their share of the liability.\textsuperscript{53} Indeed, equations (11) and (12) reveal that if, for

\textsuperscript{50} For $r = 1/2$, conditional on settling with one defendant, the plaintiff is indifferent between doing so with Row or Column. To simplify the exposition, we assume that in this case, too, it chooses to settle with Column.

\textsuperscript{51} Recall the condition of equation (17) that $S_R < 1$. We show that this condition is met whenever the plaintiff chooses the $(-s, s)$ outcome. See appendix to Kornhauser & Revesz, supra note 2, propositions 1 and 2.

\textsuperscript{52} See note 57 infra.

\textsuperscript{53} Equations (21) and (22) are conditional on $t < 1$. Otherwise, the plaintiff would be recovering all of its damages from one defendant and would not be able to recover from the other. For $t \geq 1$, the plaintiff’s optimal set of offers is either $(1 - e, 1 - e)$, where $e$ is infinitesimally small, or, alternatively, $(0, p + t)$ or $(p + t, 0)$. It will choose one of the latter options over the former for $t \geq 2 - p$. It is interesting that in this range, the plaintiff’s
example, $\sigma_R$ is less than $(p + t)/(1 + p)$, an increase of one unit in the settlement demanded of Row leads to a decrease of only $p$ units in the settlement that can be extracted from Column. But for $\sigma_R$ greater than $(p + t)/(1 + p)$, a decrease in one unit in the settlement demanded of Row leads to an increase of $1/p$ units (an amount larger than one) in the settlement that can be extracted from Column.

A set of necessary conditions to induce this outcome is that the plaintiff's offers ($\sigma_R$, $\sigma_C$) be such that $\sigma_R = G_R$ and $\sigma_C = G_C$. These offers guarantee that, conditional on one defendant settling, the other settles as well. They are not sufficient conditions because they leave open the possibility that both defendants might litigate.  

The reason that in the preceding paragraphs we were able to define with ease the necessary conditions but had to reserve the articulation of sufficient conditions is that, for certain values of the parameters, a given pair of offers satisfies the conditions for inducing both the $(s, s)$ and $(\neg s, \neg s)$ outcomes. In such cases, there are two scenarios, defined by whether the pair of offers $(G_R, G_C)$ is outside or inside the region for which the two outcomes are possible. The former case is the simpler one, because then the pair of offers $(G_R, G_C)$ induces the $(s, s)$ outcome.

The latter case is illustrated in Figure 1. As the figure makes clear, the plaintiff maximizes its recovery if the defendants accepted the $(G_R,$

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optimal settlement strategy is to obtain its full payoff from only one defendant. Note that the settling defendant would not pursue its action for contribution against the other because the litigation costs would be higher than its recovery.  

54 In a "no commitment" model, see note 45 supra, the plaintiff would be able to settle with each defendant for $(p + t)/(1 + p)$ only if, given that one defendant settles for this amount, the plaintiff's threat of litigation against the other is credible. This requires  

$$p[1 - (p + t)/(1 + p)] > t$$

or, equivalently,

$$t < p/(2p + 1).$$

Under this restriction, the analyses of the commitment and no commitment models coincide.

Note that when $p$ is close to 1, the upper bound on litigation costs is close to $1/3$. Even for $p$ as low as $1/2$, $t$ may be as high as $.25$. As $t$ is the per-defendant cost, total litigation costs expended can be as high as half the amount of the claim if plaintiff sues only one defendant and as high as $(.5 + .25u)$, the amount of the claim if plaintiff sues both. For $u = 2$, total litigation costs can be equal to the amount of the claim, and the two models will still yield identical results.

55 The formal conditions are defined in the appendix to Kornhauser & Revesz, supra note 2, lemma 2. This complication does not arise for uncorrelated probabilities.

56 The formal conditions are defined in the appendix to id., lemma 1. This complication does not arise for uncorrelated probabilities.
$G_C$ offers, but the defendants would both be better off if they both litigated, with Row and Column paying $S_R$ and $S_C$, respectively. We assume that in response to a pair of settlement offers, the defendants will choose the outcome that, from their perspective, is Pareto dominating. Thus, Row and Column would both choose to litigate. To avoid litigation, the plaintiff will choose settlement offers in the boundary of the region of multiple outcomes, either $(S_R, \Theta_C)$ or $(\Theta_R, S_C)$. Equations (15)–(18) reveal that the latter pair maximizes the plaintiff’s expected payoff. Thus, in this region,

$$V_{b,t}(s, s) = S_C(\delta, t) + \Theta_R(\delta, t) < V_{b,t}(s, s). \quad (23)$$
Note that this complication does not affect the plaintiff’s choice among the outcomes, it merely changes the offers that it makes in order to obtain a settlement with both defendants.\footnote{57}

III. Outcomes of the Game

We first solve the problem for the cases in which the probabilities of success against the defendants are uncorrelated ($\delta = 1$) and perfectly correlated ($\delta = 1/p$). We then study the plaintiff’s optimal behavior for the full range of correlations $\delta$. Finally, we return to the comparison between joint and several and nonjoint liability.

A. Uncorrelated Probabilities

To determine the plaintiff’s optimal strategies, for different ranges of litigation costs, we plot, in Figure 2, the plaintiff’s expected payoff under the three relevant outcomes as a function of litigation costs. The values are obtained by substituting $\delta = 1$ into equations (19)–(21). The intersections among these payoffs occur at the following values of $t$:

- $t_1$: intersection between $V(\neg s, \neg s)$ and $V(\neg s, s)$,
- $t_2$: intersection between $V(\neg s, \neg s)$ and $V(s, s)$, and
- $t_3$: intersection between $V(\neg s, s)$ and $V(s, s)$.

Figure 2 illustrates the expected payoff functions under two cases: low $r$ (case 1) and high $r$ (case 2). Recall that $r \leq 1/2$; thus high $r$ means $r$ close to 1/2. The thick line indicates the strategy that maximizes the plaintiff’s expected payoff. When $r$ is sufficiently low, the plaintiff chooses ($\neg s$, $\neg s$) for $0 \leq t < t_1$, ($\neg s$, $s$) for $t_1 \leq t < t_3$, and ($s$, $s$) for $t \geq t_3$. As $r$ increases, $V(\neg s, s)$ shifts downward; for sufficiently large $r$, its intersection with $V(s, s)$ occurs at lower $t$ than its intersection with $V(\neg s$, $\neg s)$. Thus, as Figure 2 indicates, there is no longer a range of values of $t$ for which the plaintiff would choose ($\neg s$, $s$). The plaintiff now seeks ($\neg s$, $\neg s$) for $0 < t < t_2$ and ($s$, $s$) for $t \geq t_2$.\footnote{58}

Several conclusions can be derived from Figure 2. First, it shows that the intercept at $t = 0$ is largest for $V(\neg s, \neg s)$. Thus, when the costs of litigation are sufficiently low, the plaintiff will prefer to litigate against

\footnote{57} Finally, substituting $\sigma_C = S_C$ into (11) and (12) defines the sufficient condition on $\sigma_R$ for the ($\neg s$, $s$) outcome, namely, $\sigma_R > \max\{S_R, \min(\Theta_R, \Theta_3)\}$, where $\Theta_R = (p + t - S_C)/p$. 

\footnote{58} A full proof is in the appendix to Kornhauser & Revesz, supra note 2, proposition 1.
both defendants. This result shows that the conclusion of Section I extends to positive litigation costs.

Second, the slope of the expected payoffs, which is constant in all three cases, is negative for $V(-s, -s)$ and $V(-s, s)$ and positive only for $V(s, s)$. Thus, when the costs of litigation are sufficiently high, the plaintiff will settle with both defendants. The slope is negative for $V(-s, -s)$
because the plaintiff must bear, under the American rule, its own costs of litigation. In contrast, for \( V(s, s) \), the slope is positive because, given our assumption that the plaintiff makes take-it-or-leave-it offers, it is able to appropriate, from the defendants, the surplus that they receive from settling rather than litigating. For \( V(\neg s, s) \), there are two countervailing effects. On the one hand, the plaintiff litigates against Row, so its expected payoff from the litigation decreases as the costs of litigation increase. On the other hand, as these costs increase, the plaintiff can extract a higher settlement from Column.

Third, \( V(\neg s, \neg s) \) and \( V(s, s) \) are independent of \( r \). For \( V(\neg s, s) \), in contrast, the slope is independent of \( r \) but the intercept decreases as \( r \) increases. Figure 2 shows that the plaintiff is better off when \( r \) is small because there is then a range in which \( V(\neg s, s) \) is greater than both alternatives. Furthermore, as \( r \) becomes smaller, the surplus produced by \( V(\neg s, s) \) gets larger.

Fourth, only \( V(\neg s, \neg s) \) is dependent on \( u \). As \( u \) increases, the slope becomes more negative, resulting in a lower expected payoff to the plaintiff from litigating with both defendants and producing a switch to one of the other strategies at a lower \( t \). The reason, of course, is that, as \( u \) increases, the plaintiff’s costs of litigation with both defendants for a given level of \( t \) increase, and litigation with both therefore becomes less attractive.

### B. Perfectly Correlated Probabilities

We now substitute \( \delta = 1/p \) into equations (19)–(21) and (23) and plot, in Figure 3, the plaintiff’s expected payoffs under the three outcomes. Once again, there are two different cases: low \( r \) (case 1) and high \( r \) (case 2). When \( r \) is sufficiently low, the plaintiff chooses \( (\neg s, s) \) for \( 0 < t < \tau_3 \) and \((s, s)\) for \( t \geq \tau_3 \). As \( r \) increases, \( V(\neg s, s) \) shifts downward, and, for sufficiently large \( r \), the plaintiff settles with both defendants for every value of \( t \). At low \( t \), however, the set of offers \((G_R, G_C)\) could induce either the \((s, s)\) or \((\neg s, \neg s)\) outcome. To ensure settlement, the plaintiff must therefore modify its offers, as set forth in equation (23), and is able to obtain only \( V'(s, s) \).

Figure 3 shows, first, that the intercept at \( t = 0 \) is smallest for \( V(\neg s, \neg s) \). When \( r \) is low, the intercept is largest for \( V(\neg s, s) \); in contrast, when \( r \) is high, the intercept is largest for \( V(s, s) \). Thus, for zero litigation.

---

59 A full proof is in the appendix to id., proposition 2.

60 \( V(\neg s, s) \) and \( V'(s, s) \) have the same intercept, but \( V'(s, s) \) is not an equilibrium solution for low \( r \).
costs, the plaintiff settles with both defendants for sufficiently high $r - r > p/(1 + p)$—and settles only with Column for smaller $r$. As indicated in Section I, the plaintiff never litigates against both defendants.61

Second, as in the case of uncorrelated probabilities, the slope of the expected payoffs, which is constant for each of the cases, is negative for

61 See text around notes 31–32 supra.
with when contrast, probabilities dependent expected recovery.

Equation given on between appear the s). better increases. Thus, as r becomes smaller, the surplus produced by \( V(\neg s, s) \) gets larger.

Returning to the case of zero litigation costs, at first glance it would appear that if the plaintiff settles with Column, it ought to be indifferent between actually litigating with Row or, instead, settling for the expected value of the litigation. If the plaintiff settles with Column for \( S_C = p(1 - r) \), Row faces an expected cost of \( p[(1 - p)(1 - r)] \). But, conditional on Row settling for that amount, Column may prefer to litigate rather than settle. This will be the case when its expected cost of litigation, given that Row settles for \( p[(1 - p(1 - r)] \) is smaller than \( p(1 - r) \), that is, if

\[
p\{1 - p[1 - p(1 - r)]\} < p(1 - r).
\]

Equation (24) simplifies to \( r < p/(1 + p) \). In this range of \( r \), if the plaintiff made settlement offers of \( \{p[(1 - p)(1 - r)], p(1 - r)\} \), Column would settle rather than litigate, thereby decreasing the plaintiff’s expected recovery. Thus, in order to maximize its expected recovery, the plaintiff cannot allow Row to settle—its settlement offer must be sufficiently high that Row will refuse it.\(^6^3\)

\(^6^2\) For perfectly correlated probabilities, \( u \) is irrelevant to the plaintiff’s strategy and expected payoff because the plaintiff never chooses \( V(\neg s, \neg s) \), the only payoff function dependent on \( u \).

\(^6^3\) The results generated in this section are not identical to those in Easterbrook, Landes, & Posner, *supra* note 1. Like us, they model a legal rule that allows contribution only among nonsettling defendants. See *id.* at 363. Under this rule, a nonsettling defendant cannot seek contribution from a settling defendant, and a settling defendant cannot seek contribution from a nonsettling defendant. See *id.* (noting that the payoff of a settling defendant is equal to the amount of the settlement). Also like us, they model a pro tanto setoff rule. See *id.*

In other respects, however, the two models are somewhat different. First, Easterbrook, Landes, and Posner restrict their attention to the case of perfect correlation of the plaintiff’s probabilities of success in litigation; unlike us, they do not consider uncorrelated, and partially correlated, probabilities. Second, they study the problem only for zero litigation costs; we, instead, consider the full range of litigation costs. Third, they provide an n-defendant analysis; we examine only the case of two defendants.

Fourth, they consider only the symmetric case in which the defendants have an equal share of liability (that is, \( r = 1/n \)). Indeed, in the case of no contribution, they assume, at
Recall the central conclusion of Section I: that for uncorrelated probabilities, joint and several liability discourages settlement. When, instead, the probabilities are perfectly correlated, the result is somewhat more complex. If the shares of the liability of the two defendants are relatively similar, joint and several liability unambiguously encourages settlement. Whereas under nonjoint liability the plaintiff is indifferent between settling and litigating, here it prefers to settle. Thus, settlements will occur not only when the parties are risk-neutral and share common beliefs about the plaintiff's probability of success but also when they are somewhat risk-preferring or somewhat optimistic. In contrast, if the shares of the liability of the two defendants are sufficiently different, joint and several liability encourages settlement with respect to the defendant with the larger share of the liability but discourages settlement with respect to the other defendant.

This result is less general than our result concerning uncorrelated probabilities. For example, in the case of the apportioned setoff rule, the plaintiff is indifferent between settling and litigating. We showed in Section I that when the plaintiff settles with both defendants, its recovery is least implicitly, that in the event that more than one defendant litigates, the plaintiff would collect all of its judgment from only one defendant, and that each nonsettling defendant views this probability as 1/m, where m is the number of nonsettling defendants. See id. at 358. In translating this analysis to the problem of contribution, see id. at 363, they must implicitly assume that r = 1/n, where n is the total number of defendants. In contrast, we look at the full range of r ≤ 1/2.

Fifth, their bargaining model is not fully specified: they do not indicate, for example, the order in which the parties make the offers, or how many moves each party can make. See id. at 356–64. In contrast, under our model, the plaintiff makes simultaneous take-it-or-leave-it offers, the defendants either accept them or reject them, and the plaintiff then litigates against the nonsettling defendants.

In the case of r = 1/2, i = 0, δ = 1/p, and n = 2, and where all parties have the same estimates of the plaintiff's probability of success in litigation, the overlap between our approaches is greatest. Their analysis yields two central conclusions. First, the plaintiff will settle with both defendants. Compare id. at 357 (first equation) with id. at 359 (eq. [7]) (establishing that settlement with all defendants occurs if the parties have the same estimate of the plaintiff's probability of success). Second, each defendant enters into an identical settlement. See id. at 359.

In contrast, we show that the plaintiff will settle with both defendants, but that the amounts of the settlements will not be equal. Indeed, the symmetric offers [p/(1 + p) p/(1 + p)] can yield either an (s, s) or (¬s, ¬s) outcome, where the former gives the plaintiff a higher expected recovery. Rather than risk an (¬s, ¬s) outcome, the plaintiff makes asymmetric settlement offers. See text around notes 54–57 supra. Given the absence of further specification of the Easterbrook, Landes, & Posner bargaining model, we cannot ascertain whether the differences between their results and ours stem solely from the differences in the structures of our games.

Polinsky & Shavell, supra note 1, restrict their attention to perfect correlation of the plaintiff's probabilities of success in litigation, zero litigation costs, and two defendants with equal shares of the liability. Under their model, the defendants make take-it-or-leave-it offers. See id. at 469–70.
The expected value of litigation against both defendants.\(^{65}\)

C. The Impact of the Correlation of Probabilities

Here, we seek to determine the impact on the plaintiff’s strategy and expected payoff of the correlation of probabilities. For simplicity, we restrict our attention in this section to the case of zero litigation costs. The various expected payoffs are plotted in Figure 4 under the two relevant scenarios: low \(r\) (case 1) and high \(r\) (case 2). The values are obtained by substituting \(t = 0\) into equations (19)–(21), and (23). The intersections among these payoffs occur at the following values of \(\delta\):

\[
\delta_1: \text{intersection between } V(\neg s, \neg s) \text{ and } V(s, s), \\
\delta_2: \text{intersection between } V(\neg s, s) \text{ and } V(s, s), \text{ and} \\
\delta_3: \text{intersection between } V(\neg s, s) \text{ and } V(s, s).
\]

In both cases (low \(r\) and high \(r\)), the plaintiff chooses \((\neg s, \neg s)\) for \(1 \leq \delta < \delta_1\). For low \(r\), the plaintiff chooses \((\neg s, s)\) for \(\delta \geq \delta_1\). For high \(r\), it chooses \((\neg s, s)\) for \(\delta_1 \leq \delta < \delta_3\). For \(\delta \geq \delta_3\), the plaintiff’s payoff is maximized with \(V(s, s)\), but because for that range of \(\delta\) (and \(t = 0\)) the pair of offers \((G_R, G_C)\) can induce either the \((s, s)\) or \((\neg s, \neg s)\) outcome,\(^{66}\) the plaintiff’s recovery from settling with both defendants is limited to \(V'(s, s)\).\(^{67}\)

Figure 4 shows that the conclusion in Section I that joint and several liability discourages settlements when the probabilities are uncorrelated extends to partial correlations. Similarly, the conclusions in the prior section about the effects of joint and several liability on settlement when the probabilities are perfectly correlated extend to less than perfect correlation.

We can now make a general observation about the impact of joint and several liability on settlements over the full range of correlations of the plaintiff’s probabilities of success. For simplicity, we restrict this analysis to the case of zero litigation costs and to the comparison between the \((s, s)\) and \((\neg s, \neg s)\) outcomes. Recall from Section I that joint and several liability provides the plaintiff with a surplus when it litigates with both defendants: this surplus is the difference between \(V(\neg s, \neg s)\) and \(p\), the

\(^{64}\) See text around notes 36–38 supra.

\(^{65}\) For a fuller analysis of this problem, see Kornhauser & Revesz, supra note 17.

\(^{66}\) See appendix to Kornhauser & Revesz, supra note 2, lemma 1.

\(^{67}\) A full proof is in the appendix to id., proposition 3.
expected value of litigation under nonjoint liability. As equation (19) shows, this litigation surplus decreases linearly with $\delta$ and, for zero litigation costs, becomes zero when the probabilities become perfectly correlated.

At the same time, joint and several liability provides the plaintiff with a different kind of surplus when it settles with both defendants: this sur-
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**FIGURE 5.—Settlement incentives**

plus is the difference between \( V(s, s) \) and \( p \), the expected value of settlement under joint and several liability. Equation (21) shows that this surplus is independent of \( \delta \). For relatively uncorrelated probabilities, the litigation surplus is greater than the settlement surplus, and the plaintiff therefore chooses to litigate. For relatively correlated probabilities, the reverse is true, and the plaintiff therefore chooses to settle.\(^68\)

Equations (19) and (21) show that in the case of uncorrelated probabilities, the plaintiff’s excess expected recovery from litigating against both defendants is given by \( p^2(1 - p)/(1 + p) \), which is maximized at approximately \( p = 0.62 \). In the case of perfectly correlated probabilities, the excess expected recovery from settlement with both defendants is given by \( p(1 - p)/(1 + p) \), which is maximized at approximately \( p = 0.41 \).

The amount of the excess recovery affects the choice among outcomes if the parties are not risk-neutral or do not share common beliefs. For example, the plaintiff will settle with both defendants when the parties are risk-preferring or have optimistic beliefs only if settlement with both defendants is the preferred option in the model involving risk neutrality and common beliefs and the corresponding excess recovery is of sufficient size. Conversely, the plaintiff will litigate with both defendants when the parties are risk-averse or have pessimistic beliefs only if litigation against both defendants is the preferred option in the model involving risk neutrality and common beliefs and the excess recovery is sufficiently large.

Figure 5 shows the impact of the plaintiff’s probabilities of success and the correlation of these probabilities on the incentives for settlement with both defendants (as opposed to litigation against both defendants).

**D. Further Comparison with Nonjoint (Several Only) Liability**

In Section I, we compared joint and several liability with nonjoint (several only) liability when litigation costs are zero. Here, we perform this comparison for positive litigation costs. Once again, we restrict our atten-

\(^68\) Edward Sherry offered a similar intuition in comments to us.
tion to the plaintiff’s choice between settling with both defendants and litigating with both defendants.

We can write the maximum settlements that Row and Column, respectively, would pay under nonjoint liability as

$$\sigma_{R,NJ} = rp + t$$  \hspace{1cm} (25)

and

$$\sigma_{C,NJ} = (1 - r)p + t.$$  \hspace{1cm} (26)

Note that, unlike the case of joint and several liability, here the amount that one defendant is willing to pay in settlement is independent of whether the other defendant litigates or settles and, in the latter event, of the amount of the settlement.\(^{69}\)

The plaintiff will make take-it-or-leave-it offers for the amounts in (25) and (26), totaling \(p + 2t\), and those offers will be accepted. We thus write

$$V_{b,t,NJ}(s, s) = p + 2t.$$  \hspace{1cm} (27)

The comparison of (21) and (27) shows that \(V(s, s) > V_{NJ}(s, s)\) if and only if \(t < (1 - p)/2\). For larger values of \(t\), the plaintiff recovers more from settling with both defendants in the absence of joint and several liability. The explanation is relatively straightforward. Under joint and several liability, we have modeled a setoff rule that, in cases in which one defendant settles and the other litigates, reduces, by the amount of the settlement, the plaintiff’s recovery from the nonsettling defendant. Thus, where the plaintiff settles with one defendant and litigates with the other, it can never recover more than the full amount of its damages.

In contrast, the prevailing rule under nonjoint liability, which is reflected in (25) and (26), does not constrain the plaintiff’s recovery in this manner.\(^{70}\) Thus, if the plaintiff settles with one defendant for more than this defendant’s share, it can obtain from the nonsettling defendant its share, thereby obtaining a total recovery that is larger than its damages. This feature is also present under joint and several liability in the unconstrained version of the apportioned setoff rule.

To avoid having our comparison dominated by the difference between

\(^{69}\) As indicated above, under nonjoint liability, the plaintiff’s expected recovery from litigating against the defendants is independent of the correlation of the plaintiff’s probabilities of success. See note 9 supra. Leaving aside litigation costs, the plaintiff’s expected recovery from Row can be written as \(\delta p^2 r + p(1 - \delta p)r = pr\). Its expected recovery from Column can be written as \(\delta p^2 (1 - r) + p(1 - \delta p)(1 - r) = p(1 - r)\).

\(^{70}\) See note 8 supra.
the constrained nature of the pro tanto setoff rule and the unconstrained nature of the prevalent interpretation of nonjoint liability, we use a hypothetical nonjoint liability rule that constrains the total recovery by the amount of the plaintiff’s damages in the event that it litigates with one defendant and settles with the other (a one-satisfaction version of nonjoint liability). Then, the plaintiff’s recovery from settling with both defendants under nonjoint liability is never greater than under joint and several liability.\footnote{71}{See appendix to Kornhauser & Revesz, \textit{supra} note 2, proposition 4.}

We define the settlement benefit to be the plaintiff’s payoff from settling with both defendants minus its expected payoff from litigating with both defendants. For nonjoint liability, the settlement benefit is obtained by subtracting \( p - ut \) from an amount that is never greater than the plaintiff’s recovery from settling with both defendants under joint and several liability. This amount is positive over the full range of \( t \). For joint and several liability, the settlement benefit is obtained by subtracting the right-hand side of equation (21) from the right-hand side of equation (19).

It is easy to see that, for perfectly correlated probabilities, the settlement benefit under joint and several liability is larger than under nonjoint liability for sufficiently small litigation costs; for larger \( t \), the two settlement benefits are equal. The reason is that the expected value of litigating is the same under the two rules, but, for low \( t \), the value of settling is higher under joint and several liability. Thus, for perfectly correlated probabilities, joint and several liability encourages settlements for sufficiently small transaction costs and has a neutral effect for larger litigation costs.

In contrast, for uncorrelated probabilities, the settlement benefit is negative for sufficiently small litigation costs, consistent with our conclusion that joint and several liability discourages settlements. For larger litigation costs, the settlement benefit is positive but smaller than under nonjoint liability. This result is easiest to see for sufficiently high litigation costs: the amount obtained in settlement is the same under both joint and several liability and nonjoint liability, but the expected value of litigation is higher under joint and several liability. Thus, for uncorrelated probabilities, joint and several liability discourages settlements over the full range of litigation costs.

IV. Conclusion

The analysis in this article extends our prior work on the differences between joint and several liability and nonjoint (several only) liability.
Our work on infinitely solvent tortfeasors concluded that negligence rules are efficient under joint and several liability as long as the standards of care for each of the actors are set at the socially optimal level but that negligence rules are not generally efficient in the absence of joint and several liability. We also determined that strict liability rules are not efficient regardless of whether there is joint and several liability.72

In our article on potential insolvency among joint tortfeasors, we determined that it is not possible to draw any general conclusion about whether, on efficiency grounds, joint and several liability is preferable to nonjoint liability. This conclusion is applicable to both negligence and strict liability.73

Here, we show that joint and several liability has the effect of discouraging settlements when the plaintiff’s probabilities of success are sufficiently uncorrelated and, in general, of encouraging settlements when the probabilities are sufficiently correlated.

72 Kornhauser & Revesz, Sharing Damages, supra note 3.
73 Kornhauser & Revesz, Apportioning Damages, supra note 3.