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EMOTIONAL RESPONSES IN LITIGATION

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I. INTRODUCTION

Litigation is, by its very nature, an adversarial process. It can result in parties involved feeling aggrieved in response to both the actions chosen by others and the actions that a priori had been expected of others. Parties often want to have their day in court in order to see justice done or to vent a retributive intent. This paper shows that certain emotions can result in a higher frequency of trials occurring in a general class of litigation games than in the absence of such emotional factors. Such emotions usually depend not only on the behavior of another but also on the beliefs over that behavior. Ellickson (1991, 1989, 1987) has criticized law and economics for using a limited notion of what constitutes rational behavior and suggested expanding the rational actor model to incorporate other elements. We begin just such an extension in this paper.

There are two central questions about legal disputes: What are the incentives for a plaintiff to sue? What determines the decision of a defendant to settle or go to court? In fact, many suits that could be brought are not, and of those suits that are filed, most do not result in a trial. Theoretical analyses of the litigation process can be divided into three stages. The first stage includes models by Landes (1971), Gould (1973), and Posner (1973), and culminates with Shavell (1982). Single-person decision theory is used in these studies to describe rational choices by potential litigants. The second stage maintains the symmetric information assumption but explicitly models the strategic interaction of multiple decision-makers. A re-

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cent example of such a model is Hause (1989). A third stage postulates asymmetric information as the reason for differing beliefs over the result of a trial. The models in this group can be subdivided as either involving exogenous settlement offers, as in P'ng (1983), or endogenous settlement offers, as in Samuelson (1983), Bebchuk (1984), Reinganum and Wilde (1986), and Nalebuff (1987). A recent example of such a model with two-sided asymmetric information is Schweizer (1989). Sherry (1984) synthesizes game-theoretic models of litigation in addition to providing several original models. Cooter and Rubinfeld (1989) provide another excellent survey and review of this literature.

All of these models, however, consider only monetary incentives to litigate, since in these models litigants' utility functions depend only on monetary wealth. Although financial considerations are certainly important determinants of the incentives to sue, settle, or go to trial, nonfinancial emotional reasons may be just as important, if not more so, in light of the adversarial nature of litigation. In fact, the two types of incentives are not mutually exclusive. For example, in divorce suits, monetary and emotional factors can often coexist and interact, while in a recent suit over frozen in vitro embryos, emotional considerations would seem to dominate financial ones. But, in this last example, the emotions involved might simply be exogenously given. Such exogenous preference for suing or failing to settle leads to an increase in the frequency of trials in a straightforward manner; however, it leaves open the issue of where those emotions come from. The answer that some people are "predisposed toward anger" can be given, but it does not apply to most of the population. Emotions could also be in response to incorrect beliefs over behavior, but there remains the issue of why those beliefs persist. Emotions, more often than not, arise in reaction to the beliefs over behavior by another party, where those beliefs are fulfilled or correct in equilibrium.

The difference between belief-independent and belief-dependent emotional responses is conceptually illustrated by the difference between anger due to another party bargaining hard versus anger due to another party bargaining harder than expected. This difference can be made operational by observing whether emotional responses are always the same for a given outcome or differ depending on the beliefs at different times. In the first case, emotional responses are belief-independent; in the second case, emotional responses are belief-dependent. We refer to belief-dependent emotional responses as psychological responses. Geanakoplos, Pearce, and Stacchetti (1989) have termed strategic environments involving psychological responses psychological games. The interplay of strategic interactions with these psychological reactions is exactly what is captured by psychological games. In psychological games, players' utilities depend not only on the strategy choices of all players, and hence indirectly on beliefs about such choices via their influence on strategy choices, but also directly on the beliefs of all players about each other's choices, beliefs about beliefs about choices, and so forth. This allows for a formal method of modeling such psychological responses as pride, joy, surprise, anger, confidence, disappointment, and embarrassment. Although it might be possible to model emotions by just changing the terminal payoffs in a game, this is inappropriate whenever emotional responses cannot be given exogenously, but instead are determined endogenously in equilibrium. No single set of fixed payoffs can fully capture emotions that are belief-dependent.

In this paper, we study both belief-independent and belief-dependent (psychological) emotional responses. We prove that anger or pride can lead to an increased equilibrium frequency of trials. We also show that seeking revenge or vengeance can guarantee that the threat of going to trial is a credible one. We show that belief-dependent emotional responses can result in behavior that does not occur if there are no emotional responses or belief-independent emotional responses.

Section II discusses a class of normal form games to show that pretrial bargaining in the presence of anger or pride results in a higher equilibrium frequency of trials than in the same class of games of pretrial bargaining in the absence of any emotional responses. Section III examines emotional responses in sequential games involving suit and settlement decisions. It also explains how the threat of a trial can become credible in the presence of emotional responses, even when a case has nonpositive expected wealth value for the litigants. The issue of sequential rationality is also explored. Section IV considers emotional responses on the part of multiple tortfeasors. Section V offers concluding remarks on the importance and prevalence of emotional responses not only in litigation but also in other areas of law and economics.

II. EMOTIONAL RESPONSES IN PRETRIAL BARGAINING

Consider the general class of normal form games presented in Figure 1, which generalize an expository game introduced by Cooter and Ulen (1988) to illustrate the possibility of trials due to both sides bargaining hard in pretrial negotiation. Both a plaintiff and a defendant can use either soft- or hard-bargaining strategies in a pretrial negotiation game, with the payoffs as given. The plaintiff is the row player (player one), while the defendant is the column player (player two). We assume that the payoffs satisfy $0 \leq a < b < c < d$. If both the defendant and the plaintiff adopt soft-bargaining strategies, they split evenly the aggregate stakes of $2c$. If they both adopt hard-bargaining strategies, they split evenly the aggregate stakes net of their common litigation costs, $2a$, so that $a = c - t$, and $t =$ the cost of a trial. If they do not adopt equally strong-bargaining strategies, the one using the harder bargaining strategy receives a larger share, d, than the share the softer bargainer receives, b, where $d + b = 2c$. Let p represent the probability that the plaintiff uses a hard-bargaining strategy, and q be the probability that the defendant uses a hard-bargaining strategy. There are three Nash equilibria: two pure strategy ones, $(p, q) = (1, 0)$ and $(p, q) = (0, 1)$, and one symmetric mixed strategy one, $p^* = q^* = (d - c)/t$.[1] In equilibrium, the frequency of trials is $f = p^*q^* = (d - c)^2/t^2$. We note these comparative statics results: (1) as the cost of litigation rises, the equilibrium frequency of trials decreases at an increasing rate, and (2) as the gain from bargaining hard if the other party is bargaining soft increases, the equilibrium frequency of trials increases at an increasing rate.[2]

In Cooter and Ulen's numerical example, $a = 0$, $b = 40$, $c = 50$, and $d = 60$. That game has two pure strategy Nash equilibria: $(p, q) = (1, 0)$ and $(p, q) =$

[1]This is found by solving this pair of equations:

$$aq + d(1 - q) = bq + c(1 - q), \text{ and}$$
$$ap + d(1 - p) = bp + c(1 - p).$$

This implies that $p^* = q^* = (d - c)/[(b - a) + (d - c)] = (d - c)/(c - a) = (d - c)/t$, because $d + b = 2c$ and $c - a = t$.

[2]These comparative statics results are formally derived as follows:

$$(1)\ \partial f/\partial t = -2(d - c)^2/t^3 < 0 \text{ and } \partial^2 f/\partial^2 t = 6(d - c)^2/t^4 > 0; \text{ and}$$
$$(2)\ \partial f/\partial(d - c) = 2(d - c)/t^2 > 0 \text{ and } \partial^2 f/\partial^2(d - c) = 2/t^2 > 0.$$

		Defendant	
		Hard	*Soft*
Plaintiff	*Hard*	(a, a)	(d, b)
	Soft	(b, d)	(c, c)

FIGURE 1. Unemotional pretrial bargaining

(0, 1), and a symmetric mixed strategy Nash equilibrium: $(p, q) = (0.2, 0.2)$, with an equilibrium frequency of trials, $f = pq = 0.04$. So of the suits that are brought, 4 percent end in trial and 96 percent are settled.

In Figure 2, the payoffs when both parties bargain hard in Figure 1 have been modified to capture the belief-independent emotional responses of anger, pride, or seeking revenge.[3] This means that x and y are exogenously given positive numbers.

If both parties have belief-independent emotional responses of a sufficiently small magnitude, then equilibrium behavior does not change; if only one party has a belief-independent emotional response of a sufficiently large magnitude, the only equilibrium is $(p, q) = (1, 0)$ or $(0, 1)$; finally, if both parties have belief-independent emotional responses of a sufficiently large magnitude, the dominant strategy equilibrium is $(p, q) = (1, 1)$.[4]

In Figure 3, we have modified the payoffs of Figure 1 to reflect the psychological (belief-dependent) responses of anger and pride. The defendant is angered by a plaintiff, who is expected to bargain hard (and does), and is happy to choose a hard-bargaining strategy in response. The plaintiff is proud to have chosen a hard-bargaining strategy in response to a defendant, who is expected to bargain hard (and does). To keep things simple, we assume that the defendant cares about n, the mean of his beliefs about p, and that the plaintiff cares about r, the mean of her beliefs about q. We assume that the defendant's payoff is $a + dn$ and the plaintiff's payoff is $a + dr$, if both parties adopt hard-bargaining strategies. In equilibrium, $n = p$ and $r = q$. In contrast with the unemotional version of this game, $(p, q) = (1, 0)$ and $(p, q) = (0, 1)$ are not psychological equilibria.[5] As in

[3]There are several experiments of ultimatum bargaining by Binmore, Shaked, and Sutton (1985); Guth, Sdhmittberger, and Schwarze (1982); Guth and Tietz (1990); Guth (1986); and Kahneman, Knetsch, and Thaler (1986) that suggest notions of justice or fairness matter and that vengeful emotions can arise from being treated unfairly. Binmore, Shaked, and Sutton (1989) also provide evidence that is consistent with these findings in an experiment with outside options. Nalebuff and Shubik (1988) construct a model where revenge is used to resolve ties in cases of indifference over choices.

[4]If $a + x$ and $a + y$ still remain less than b, then the analysis of the unemotional version of this game continues to hold. If $a + x$ and $a + y$ are both greater than or equal to b, then bargaining hard becomes a dominant strategy for both players and the only equilibrium frequency of trial is 100 percent of the time. If $a + x$ is less than b, but $a + y$ is greater than or equal to b, then bargaining hard is a dominant strategy for the defendant and the plaintiff's best response is to bargain soft. If $a + x$ is greater than or equal to b, but $a + y$ is less than b, then bargaining hard is a dominant strategy for the plaintiff and the defendant's best response is to bargain soft. In either of the last two cases, the equilibrium frequency of trials is zero percentage of the time.

[5]A psychological equilibrium requires not only the Nash equilibrium property but also that players' beliefs are correct in equilibrium. See Geanakoplos, Pearce, and Stacchetti (1989) for the precise definition of a psychological equilibrium.

		Defendant	
		Hard	*Soft*
Plaintiff	*Hard*	$(a + x, a + y)$	(d, b)
	Soft	(b, d)	(c, c)

FIGURE 2. Belief-independent emotional responses in pretrial bargaining

the belief-independent emotional version of this game, there is a pure strategy psychological equilibrium: $(p, q) = (1, 1)$. In contrast with the belief-independent emotional version of this game, however, there are two symmetric mixed strategy psychological equilibria, namely, (p_H, q_H) and (p_L, q_L), if and only if $D = t^2 - 4d(d - c) > 0$. In the appendix, we demonstrate that $p_H = q_H = (t + D^{1/2})/2d$, $p_L = q_L = (t - D^{1/2})/2d$, and $0 < p^* < p_L < p_H < 1$.

Note that in the presence of these psychological responses, the equilibrium frequency of trials either increases or stays the same for pure strategy equilibria in comparison to a lack of such emotional responses. For mixed strategy equilibria, the frequency of trials increases under the presence of these psychological responses as compared to a lack of emotional responses. There are also multiple levels of emotional payoffs, since in equilibrium, n and r can have different equilibrium values ($n = r = p_H$ or $n = r = p_L$). This contrasts with the case of belief-independent emotions, where there is a unique level of emotional payoff in equilibrium for each player, namely $a + x$ or $a + y$. This is one of the differences between belief-independent and belief-dependent emotional responses. We mention two comparative statics results that hold provided that $D \geqslant 0$: the frequency of trials falls as the cost of litigation rises or the gain from bargaining hard if the other party is bargaining soft falls.[6]

In the case of a psychological version of Cooter and Ulen's numerical example, $(p, q) = (1, 1)$ is the symmetric pure strategy psychological equilibrium, while $(p, q) = (1/2, 1/2)$ and $(p, q) = (1/3, 1/3)$ are the two symmetric mixed strategy psychological equilibria ($1 > 1/2 > 1/3 > 0.02$). Note that in each of these equilibria, the equilibrium frequency of trial exceeds that without emotional responses. The expected payoffs in these equilibria are (60, 60), (45, 45), and (46.66, 46.66), respectively. Finally, we note that in the pure strategy psychological equilibrium in Figure 3, the welfare result that trials are pareto efficient among the possible outcomes is of course due to both parties deriving so much emotional satisfaction from trial. It is straightforward to construct a prisoner's dilemma game having

		Defendant	
		Hard	*Soft*
Plaintiff	*Hard*	$(a + dr, a + dn)$	(d, b)
	Soft	(b, d)	(c, c)

FIGURE 3. Psychological responses in pretrial bargaining

[6]These comparative statics results are derived under the assumption that $D \geqslant 0$. Then, $\partial p_L/\partial t < 0$ and $\partial p_L/\partial(d - c) > 0$. However, $\partial p_H/\partial t > 0$ and $\partial p_H/\partial(d - c) < 0$.

bargaining hard being a dominant strategy in a pure strategy psychological equilibrium, but resulting in trials being pareto-dominated by settlement.

III. EMOTIONAL RESPONSES IN SUIT AND SETTLEMENT DECISIONS

In the last section we analyzed emotional responses in normal form games of pretrial bargaining. In this section, we analyze emotional responses in sequential or extensive form games involving suit and settlement decisions. We must consider the criterion of sequential rationality or the credibility of threats in such games. Consider the situation where a plaintiff has to decide whether to file suit and the defendant has to decide whether to settle, if a suit is filed. Suppose that the plaintiff's case is weak and so the suit has negative expected wealth value for the plaintiff if the case goes to trial. Nonetheless, the plaintiff might file suit in order to extract a settlement from the defendant. Rosenberg and Shavell (1985) and Bebchuk (1988) provide models of such suits. This game is depicted in Figure 4, where the first player is the plaintiff and the second player is the defendant. Let p denote the probability that the plaintiff files a suit and q denote the probability that the defendant does not settle, if the suit is filed. There are two Nash equilibria, namely, $(p, q) = (1, 0)$ and $(p, q) = (0, 1)$. But the second Nash equilibrium involves a threat by the defendant to go to trial that is not credible. The only subgame perfect equilibrium is $(p, q) = (1, 0)$.[7]

Figure 5 presents a modification of Figure 4 in which the plaintiff's utility still only depends on the outcome, but the defendant's utility depends not only on the outcome, but also on n, the mean of the defendant's beliefs about p.

In equilibrium, of course, $n = p$. If the defendant expects the suit will be filed with probability one, then the defendant settles, in part, to avoid the cost of a trial. Such a belief will be correct in a psychological equilibrium. So, $(p, q) = (1, 0)$ is a pure strategy subgame perfect psychological equilibrium in this example.[8] On the other hand, if the defendant expects with probability one not to be sued, then a suit would enrage the defendant. In a fit of anger, such a defendant would choose to go to trial in order to "see that justice is done." The defendant's belief about suit will be correct in a psychological equilibrium. So, $(p, q) = (0, 1)$ is another pure strategy subgame perfect psychological equilibrium in this example. There is also a mixed strategy subgame perfect psychological equilibrium, in

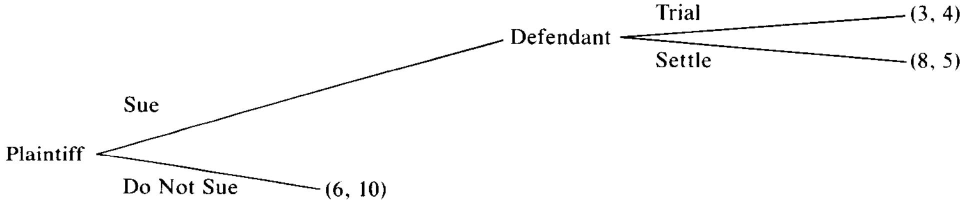

FIGURE 4. Unemotional negative expected wealth suits

[7]A subgame perfect equilibrium requires not only the Nash equilibrium property but also that any threats are credible or sequentially rational. See Kuhn (1953) for the precise definition of a subgame perfect Nash equilibrium.

[8]A subgame perfect psychological equilibrium requires not only the subgame perfect equilibrium property but also that players' beliefs are correct in equilibrium.

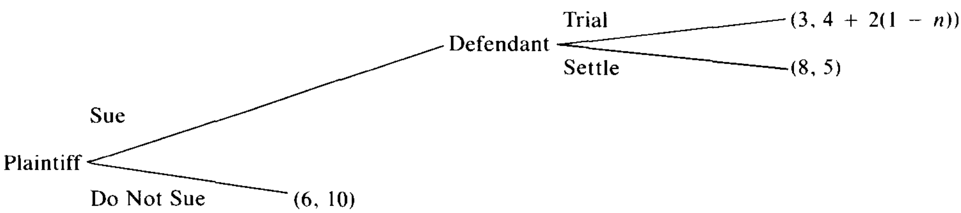

FIGURE 5. Negative expected wealth suits with psychological responses

which both players are indifferent between their choices. This mixed strategy subgame perfect psychological equilibrium is found by solving the pair of equations: $4 + 2(1 - p) = 5$ and $3q + 8(1 - q) = 6$. This results in $(p, q) = (1/2, 2/5)$ and an equilibrium frequency of trials of 1/5. Notice that in both of the pure strategy subgame perfect psychological equilibria, neither player is indifferent between their choices. This contrasts with nonpsychological (either unemotional or belief-independent emotional) extensive form games of perfect information, where, unless there are ties in payoffs, backwards induction leads to a unique subgame perfect equilibrium. If there is no emotional response on the part of the defendant, only the first outcome is a subgame perfect equilibrium, while if there is a belief-independent emotional response on the part of the defendant, only the second outcome is also a subgame perfect equilibrium. Thus, emotional responses can make credible the threat of going to court by a defendant furious at being sued by a plaintiff hoping to extract a settlement. Likewise, a defendant might go to trial in order to seek vindication in court in response to a frivolous suit that was filed to harass that defendant. This example shows that backwards induction fails to always yield a unique subgame perfect psychological equilibrium in extensive games of perfect information. This is because decision nodes reflect just a history of how a game has been played up to then, not what players' beliefs are.

Indeed, there might be even more than two subgame perfect psychological equilibria in a litigation game involving higher order beliefs (beliefs about beliefs). Suppose we define n to be the mean of the defendant's beliefs over p and m to be the plaintiff's beliefs over n. We also define r to be the mean of the plaintiff's beliefs over q and s to be the defendant's beliefs about r. Notice that m and s are second-order beliefs. Consider the payoffs of Figure 6.

These payoffs can be interpreted as follows: the plaintiff's payoff to filing suit is higher the greater is the plaintiff's belief that the defendant perceives the plaintiff to be tough, in terms of the defendant's belief that the plaintiff will sue being higher. A similar property is assumed to hold for the defendant's payoff. In addition, the plaintiff's payoff to not filing suit is lower the smaller the plaintiff's belief that the defendant perceives the plaintiff to be tough, in terms of the defendant's belief that the plaintiff's probability of filing suit being higher. This reflects disappointment from being unexpectedly discovered to have been a coward. In equilibrium, $m = n = p$ and $s = r = q$.

If psychological responses are not present, that is, there are no m and s terms, then there is a unique subgame perfect equilibrium: $(p, q) = (1, 0)$. But there are four subgame perfect psychological equilibria; three being pure strategy psychological equilibria, namely $(p, q) = (1, 1)$, $(p, q) = (0, 1)$ and $(p, q) = (1, 0)$. There is also a mixed strategy subgame perfect psychological equilibrium, namely $(p, q) = (1, 0.25)$.

The above analysis shows that the notion of subgame perfect equilibrium, while unique for unemotional or belief-independent emotional games of perfect infor-

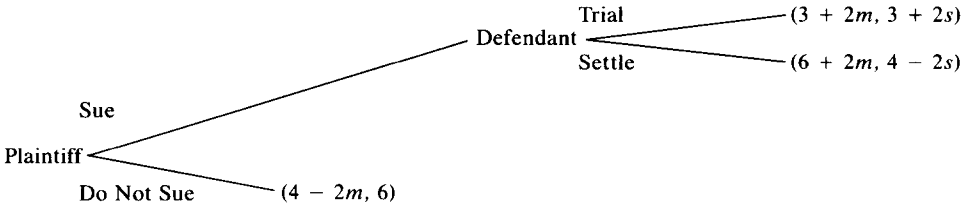

FIGURE 6. Negative expected wealth suits involving toughness, disappointment, and cowardice

mation (except for ties in payoffs), can lead to different multiple outcomes in belief-dependent perfect information games. This raises the issue of whether the alternative trembling hand perfect equilibrium concept due to Selten (1975) might lead to unique outcomes in belief-dependent perfect information games.[9] Trembling hand equilibria always exist in unemotional or belief-independent emotional perfect information litigation games. We show both how and why trembling hand perfect psychological equilibria can fail to exist in perfect information litigation games by considering suits that have zero expected financial value for the plaintiff.[10] This means that if the suit goes to trial, then the plaintiff's expected recovery is just offset by the plaintiff's legal costs. In Figure 7, the plaintiff only cares about wealth, but might bring a zero expected wealth suit in the hope of getting a settlement from the defendant. There is, however, a belief-independent emotional response of anger on the part of the defendant from being sued, which makes the defendant willing to incur the cost of trial instead of settling out of court. Such a defendant would rather pay lawyers than the plaintiff.

As before, let p denote the probability that the plaintiff files a suit and q denote the probability that the defendant does not settle, if the suit is filed. The unique trembling hand perfect equilibrium of this game is $(p, q) = (1, 1)$, that is, for the plaintiff to file suit and for the defendant to proceed to trial, because if there is even a small chance of the defendant's trembling hand choosing by error to settle, the plaintiff's best response is to have filed suit.

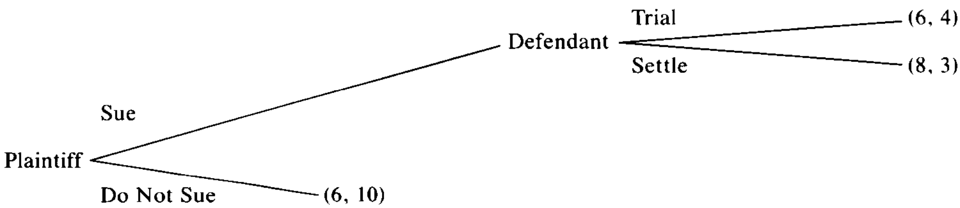

FIGURE 7. Zero expected wealth suits with a belief-independent emotional response

[9]A trembling hand perfect equilibrium requires not only the Nash equilibrium property but also that strategies are the limit of best responses to a sequence of mistakes by other players. See Selten (1975) for the precise definition of a trembling hand perfect equilibrium.

[10]A trembling hand perfect psychological equilibrium requires not only the trembling hand perfect equilibrium property but also that players' beliefs are correct in equilibrium.

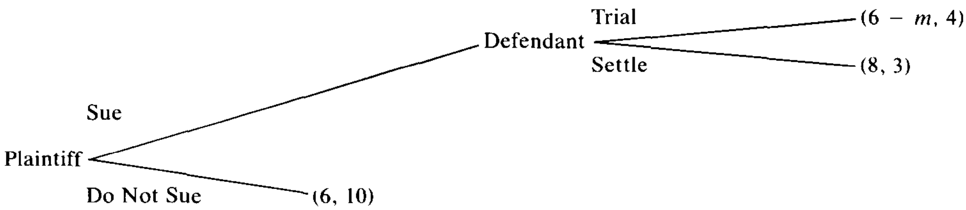

FIGURE 8. Zero expected wealth suits with a psychological response

Now consider a modification of the game in Figure 7, where the plaintiff cares about not only the legal outcome of the suit (namely, settlement or trial), but also the beliefs of the defendant about p before the suit is filed. As before, let n represent the mean of the defendant's beliefs about p and m represent the mean of the plaintiff's beliefs about n. Thus, m is a second-order belief. The payoffs in Figure 8 describe a plaintiff who is more embarrassed in court the more the plaintiff believes the defendant believes a suit is going to be filed, since this means the defendant will be that much more prepared for trial.

Of course, in equilibrium, $m = n = p$. All candidates for a trembling hand perfect psychological equilibrium involve the defendant proceeding to trial, namely, that $q = 1$. But if $q = 1$, then for any $p > 0$, $6 - m = 6 - p < 6$, so that suit is a (weakly) dominated strategy for the plaintiff. This means $p = 0$, so that $m = n = p = 0$ and Figure 8 reduces to Figure 7. But we have already shown that the only trembling hand perfect Nash equilibrium of the game in Figure 7 is $(p, q) = (1, 1)$.

The above examples considered the decisions to sue or settle only after the defendant has already taken the action that led to the suit. We can push the analysis one step further back and consider the decision by the defendant to commit the trespass, contractual breach, or tort in the first place. We can imagine that an individual outraged by an unexpected tort would bring suit even when that suit has negative expected wealth value to the plaintiff, while the same individual would not bring suit if that tort had been expected. This raises the possibility of the potential defendant engaging in behavior to reduce the (plaintiff's belief of the) probability of the tort. For example, a potential defendant might order extra tests in order to avoid malpractice suits or, in the case of contractual breach, choose to not breach or even to not enter into contracts with those known to retaliate breach. Of course, this presumes that the potential defendant knows the payoffs of the potential plaintiff at the time of injury or breach as opposed to after suit is filed. This is less likely in the case of torts as the potential defendant does not even know the identity of the potential plaintiff yet, but more likely in the case of trespass or contractual breach. There are two credible psychological equilibria: one in which a tort occurs and no suit is brought, and one that involves no tort because the threat to go to trial is a credible one.

We can also push the analysis one step further along in the litigation process by allowing the plaintiff to decide whether to drop or proceed with a suit if the defendant does not settle. We can imagine a plaintiff who is so enraged by a defendant who unexpectedly failed to settle that the plaintiff would proceed with a suit even when that suit has negative expected wealth value to the plaintiff, while that same plaintiff would drop the suit if the defendant's failure to settle had been expected. In a multistage litigation game, we can easily see how either or both sides might be frustrated by the other side's unexpected failure to settle and thus refuse to settle. This leads to the possibility of protracted litigation becoming selfgenerating as each side gets madder because the other side has not yet settled, and so the suit drags on. This might be descriptive of divorce proceedings where at each stage the decision to not settle is a response due to being incensed by the other spouse's failure to settle, which just triggers yet another round of this.

IV. EMOTIONAL RESPONSES BY MULTIPLE TORTFEASORS

Consider a situation known in common law as "joint and several liability." This refers to a case where either: (a) a victim is harmed by the joint action of several defendants, or (b) a victim's harm is not divisible among several defendants who acted independently.

In such a case, a plaintiff can either bring suit against several defendants jointly or choose to sue just one defendant for all of the damages that the plaintiff suffered. Although this allows the plaintiff to go after the "deep pocket" if the other defendants are uninsured, poor, or judgment-proof, the plaintiff is not allowed to recover more than the plaintiff's losses. A natural question arises: Does the defendant sued have the right to contribution, that is, can that defendant force the other tortfeasors to contribute to paying damages? Suppose the plaintiff is the victim of an intentional tort (as opposed to unintentional torts, there is no right of contribution among the multiple tortfeasors of an intentional tort). For a general analysis of the issue of contribution, see Polinsky and Shavell (1981).

Suppose that the plaintiff has decided to sue just one defendant and must choose which of the two potential defendants to sue. Suppose that the amount of the plaintiff's harm is \$50,000, and the cost of a trial is \$1,000 for the plaintiff. Figure 9 presents an unemotional perfect information version of this extensive form game. These payoffs assume defendant one is a deeper pocket than defendant two is. Defendant one can afford to settle for the entire amount of harm. The plaintiff's utility function is wealth divided by \$1,000. If either defendant settles, then the plaintiff will not sue the other defendant, either because the entire amount of the loss has been recovered or because the cost of trial is greater than the remainder of the harm. But if the defendant initially sued goes to court, then the plaintiff will sue the other defendant for the remaining amount of the harm. Let p represent the probability that the plaintiff chooses to bring suit against defendant one, q represent the probability that defendant one goes to court, and r represent the probability that defendant two goes to court. By backwards induction, either potential defendant settles if sued and so the plaintiff sues the deeper pocket. So, the unique subgame perfect equilibrium of this extensive game is $(p, q, r) = (1, 0, 0)$.

Consider a psychological version of the above perfect information extensive form game in which the payoffs to the plaintiff still depend only on the legal outcome, but each defendant's payoff also depends on that defendant's beliefs about what the other defendant would have done had that other defendant been sued. In particular, suppose that the satisfaction that each defendant receives from hurt-

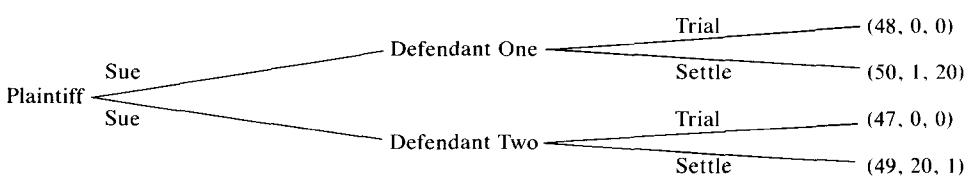

FIGURE 9. Unemotional multiple tortfeasors

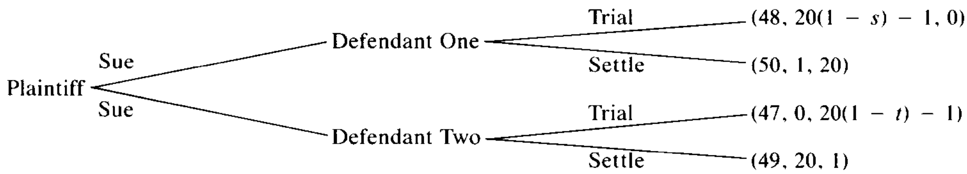

FIGURE 10. Multiple tortfeasors with psychological responses

ing the plaintiff by going to court is proportional to his disappointment from being sued. This disappointment is measured by the amount that the defendant's payoffs decrease from being sued relative to that defendant's payoffs had the other defendant been sued. To be specific, let s be defendant one's expectation of r, t be defendant two's expectation of q, and payoffs be as presented in Figure 10.

Once more, backwards induction cannot be applied to find a unique subgame perfect psychological equilibrium. What defendant one wants to do depends on what he thinks he lost by the plaintiff not suing defendant two, which, in turn, depends on what defendant two would have done if sued. But defendant two's choice depends on his beliefs about what he thinks he lost by the plaintiff not suing defendant one in the first place. This, in turn, depends on what defendant one would have done if sued, and we have come full circle. There are three subgame perfect psychological equilibria, namely $(p, q, r) = (1, 0, 1)$, $(0, 1, 0)$, and $(1, 9/10, 9/10)$. Notice that in each of the pure strategy subgame perfect psychological equilibria, the plaintiff sues the defendant choosing to settle because the other defendant's threat to go to trial is credible. In both of the pure strategy subgame perfect psychological equilibria, both defendants have unique optimal choices. In the third and mixed strategy subgame perfect psychological equilibrium, both defendants randomize in such a way as to make the other defendant indifferent over settlement or trial.

V. CONCLUDING REMARKS

We have shown how certain emotional responses can increase the number of cases brought to trial and serve to make the threat of going to trial be a credible one.[11] Although we have indicated how anger or pride can lead to a higher frequency of trials, it should be clear that emotions other than anger or pride would lead to quite different behavior. We could imagine fear, emotional distress, anxiety at the prospect of trials, or other unpleasant emotional responses that would result in a lower frequency of trials as compared to cases in which they are not present.[12] We have demonstrated that the introduction of emotional responses into

[11] Recently, novel methods besides litigation of resolving legal conflicts, such as the use of arbitration, have received attention for their flexibility. This paper suggests that another possible advantage of using arbitration is the diffusing of emotional ill-well.

[12] A whole other class of emotional responses, such as those related to compassion, sympathy, and empathy, has often been suggested as influencing juries as much as, if not more than, the factual merits of a case. This is the raison d'être of recent litigation consulting services that provide advice on jury selection and predictions of jury deliberations based on emotional and/or psychological profiles of prospective or actual jurors. Members of a jury might respond not so much logically to arguments presented in a trial, but instead

game-theoretic models of litigation can result in behavior that could not be explained otherwise. In particular, in a class of normal form games with psychological responses, there can be two mixed strategy equilibria with different equilibrium levels of anger or pride, while there is only a single mixed strategy equilibrium in the same class of games with exogenously specified emotions or no emotions. In extensive form litigation games involving psychological responses, there can be more than one subgame perfect psychological equilibria or no trembling hand perfect psychological equilibria, while a unique subgame perfect equilibrium or a unique trembling hand perfect equilibrium exists if there are exogenously specified emotions or no emotions.

We close by considering the implications of emotional responses in areas of law and economics besides litigation. Cooter (1991) proposes an economic model of the will that allows for lapses, regret, and psychological conflict. His model results in several novel policy implications for legal responses to contract breach, torts, and crimes. Akerlof (1989) studies the consequences of beliefs that are chosen endogenously (as opposed to being determined endogenously in equilibrium) in public choice models. Such optimization under illusion raises the possibility that beliefs over behavior by others might not satisfy the rational expectations condition required of a psychological equilibrium. Frank (1988, 1990) explores the wide-ranging role of various belief-independent emotional responses in strategic interactions. He proposes the use of moral sentiments as devices for (pre)commitment, for example, behaving honestly in order to avoid feelings of guilt. Hirschleiser (1987) also explains how emotional responses can serve as guarantors of threats and promises. Li (1977) and Birmingham (1969) contrast legal and moral duty as methods of social control in ancient and modern China. This suggests the use of emotional responses as first-party control techniques as opposed to relying on either suits as a means of second-party control or the formalized system of legal rules as third-party control. The deterrence of criminal activity might be accomplished not just by legal and monetary sanctions but also by feelings of remorse from behaving antisocially. This means that it could be desirable to foster the development, via education, of experiencing regret from violating social norms. Huang and Wu (1992) explore the role of alternative social norms and organizational cultures in controlling corruption.

APPENDIX: PRETRIAL BARGAINING WITH PSYCHOLOGICAL RESPONSES

A mixed strategy psychological equilibrium is computed by solving these equations:

$$(a + dr)q + d(1 - q) = bq + c(1 - q), \text{ and}$$
$$(a + dn)p + d(1 - p) = bp + c(1 - p).$$

In equilibrium, $r = q$ and $n = p$. Thus, this pair of equations is equivalent to:

$$aq + dq^2 - dq - bq + cq + d - c = 0, \text{ and}$$
$$ap + dp^2 - dp - bp + cp + d - c = 0.$$

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emotionally to evidence based on the predisposition of the juror. Repressing the logical implications of those facts that a juror finds disturbing is analogous to repressing marital grievances, which has been documented in Wallerstein and Kelly (1980). The theory of cognitive dissonance offers another explanation of why jurors would prefer to bias their selection of information rather than update their beliefs. Some implications of such cognitive imperfections for the efficiency of legal rules can be found in Ulen (1991).

By symmetry of the payoffs, we only have to solve for p in the second equation. Because $2c = b + d$, this reduces to: $dp^2 + (a - c)p + d - c = 0$. This has real solutions if and only if $D = (a - c)^2 - 4d(d - c) \geqslant 0$. The discriminant, D, can be rewritten as follows, $D = t^2 - 4d(d - c)$. If $D < 0$, there are no mixed strategy equilibria.

Suppose that $D \geqslant 0$; then there are two symmetric mixed strategy Nash equilibria, namely $p_H = q_H = (t + D^{1/2})/2d$, and $p_L = q_L = (t - D^{1/2})/2d$, which is greater than 0, because $d > c$. In fact, $p_L > (d - c)/t$, because $[t - 2d(d - c)/t]^2 = t^2 - 4d(d - c) + 4d^2(d - c)^2/t^2 > t^2 - 4d(d - c) = D$. So, $t - 2d(d - c)/t > D^{1/2}$, and $(t - D^{1/2})/2d > (d - c)/t$, as claimed. We have thus demonstrated that $p_H > p_L > (d - c)/t = p^*$, where p^* is the mixed strategy equilibrium probability in the game of unemotional pretrial bargaining.

Notice that $p_H < 1$ is equivalent to $t + D^{1/2} < 2d$, or $t + [t^2 - 4d(d - c)]^{1/2} < 2d$, or $t^2 - 4d(d - c) < (2d - t)^2$, or $t^2 - 4d(d - c) < 4d^2 - 4dt + t^2$, or $-4d^2 + 4dc < 4d^2 - 4dt$, or $8d^2 - 4d(c + t) > 0$, or $2d - (c + t) = d - c + d + a - c = 2(d - c) + a > 0$. But this is ensured by the assumptions that $a \geqslant 0$ and $c < d$.

We have thus demonstrated that $1 > p_H > p_L > p^*$ for the two mixed strategy equilibria (p_H, q_H) and (p_L, q_L). The comparative statics results can be derived under the condition that $D \geqslant 0$. It can be demonstrated that $\partial p_L/\partial t < 0$ and $\partial p_L/\partial(d - c) > 0$; while, $\partial p_H/\partial t > 0$ and $\partial p_H/\partial(d - c) < 0$.

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