WEB APPENDIX

Configuration {*TC*}

A second possible candidate for an equilibrium involves $\pi_C \geq t_C$ (where recall that $t_C \geq \pi_2*$; since any $t_C < \pi_2*$ is payoff-equivalent to $t_C = \pi_2*$ for P_1). To obtain this candidate, we maximize $\hat{u}_1(\pi_C; \hat{S}_C(\pi_C; t_C))$, yielding

$$[\pi_C\delta - k_P - \hat{S}_C(\pi_C; t_C)]f(\pi_C) + \hat{S}_C'(\pi_C; t_C)[1 - F(\pi_C)] = 0.$$

Substituting $\hat{S}_C(\pi_C; t_C) = 2[\pi_C\delta + k_D] - \gamma_C[t_C\delta + k_D]$ and $\hat{S}_C'(\pi_C; t_C) = 2\delta$, and re-arranging implies that an interior optimum (if one exists) is defined implicitly by:

$$h(\pi_C) = f(\pi_C)/[1 - F(\pi_C)] = 2\delta/\{k + \pi_C\delta + k_D - \gamma_C[t_C\delta + k_D]\}.$$

This equation implicitly describes P_1's best response π_C to P_2's belief t_C; to be an equilibrium, the marginal type, denoted $\hat{\pi}_C$, must be a best response to itself. Thus, a second candidate for an equilibrium is defined implicitly by

$$h(\hat{\pi}_C) = f(\hat{\pi}_C)/[1 - F(\hat{\pi}_C)] = 2\delta/\{k + (1 - \gamma_C)[\hat{\pi}_C\delta + k_D]\}.$$

Again, it is clear that $\hat{\pi}_C$ so-defined is less than $\overline{\pi}$ and Assumption 2' ensures that $\hat{\pi}_C > \underline{\pi}$. However, notice that $\hat{\pi}_C \geq \pi_2*$ (as required) if and only if $2\delta/\{k + (1 - \gamma_C)[\hat{\pi}_C\delta + k_D]\} \geq \delta/k$; that is, if and only if $\gamma_C \geq [\hat{\pi}_C\delta - k_P]/[\hat{\pi}_C\delta + k_D]$. This cannot hold under Assumption 3 ($\gamma_C \leq [\pi_2*\delta - k_P]/[\pi_2*\delta + k_D]$), except possibly for $\hat{\pi}_C = \pi_2*$, which is already dominated by π_C* (see the proof in the paper's Appendix). Thus, under Assumption 3, there is a unique equilibrium involving confidential settlements, which is derived in the paper's Appendix.

If we relax Assumption 3, then this candidate ($\hat{\pi}_C$) for an equilibrium will exist. However, it can be shown that (if P_2 expects the marginal defendant type in the first stage to be $\hat{\pi}_C$), then P_1 would do better by defecting to the marginal type π_C*. Thus, there can never be a pure strategy equilibrium involving $\hat{\pi}_C$.

To see this, notice that in the candidate for an equilibrium involving $\hat{\pi}_C$, P_1 demands $\hat{S}_C$ =

$(2 - \gamma_C)[\hat{\pi}_C\delta + k_D]$, which is accepted by all defendant types with $\pi \geq \hat{\pi}_C$ and rejected by all defendant types with $\pi < \hat{\pi}_C$. This results in a payoff for P_1 of $\hat{u}_1(\hat{\pi}_C; \hat{S}_C(\hat{\pi}_C; \hat{\pi}_C))$. On the other hand, if P_1 were to demand $S_C{*}$ rather than $\hat{S}_C$, then all types $\pi \in [\pi_C{*}, \overline{\pi}]$ would accept $S_C{*}$ rather than go to trial (given that P_2's beliefs and behavior are unchanged by this unobservable defection, accepting $S_C{*}$ and continuing as before with P_2 results in lower payments for all D types $\pi \in (\pi_C{*}, \overline{\pi}])$. This would result in P_1 receiving the payoff $\tilde{u}_1(\pi_C{*};\tilde{S}_C(\pi_C{*})) > \tilde{u}_1(\hat{\pi}_C; \tilde{S}_C(\hat{\pi}_C)) = \hat{u}_1(\hat{\pi}_C; \hat{S}_C(\hat{\pi}_C; \hat{\pi}_C))$, where the inequality follows since $\pi_C{*}$ maximizes $\tilde{u}_1(\pi_C;\tilde{S}_C(\pi_C))$ and the equality follows from the continuity of $u_1(\pi_C; t_C)$ at the point $\pi_C = t_C$. Thus, there can never be a pure strategy equilibrium involving $\hat{\pi}_C$. QED

Claims

Claim 1. A configuration of the form $\{OT\}$ or $\{CT\}$, wherein defendant types with relatively low values of π choose settlement, while those with relatively high values of π choose trial, cannot be an equilibrium configuration.

Proof. Consider a configuration such as $\{zT\}$, where $z = O, C$. In this case, upon observing z, P_2 will infer that $\pi \in [\underline{\pi}, \pi_{zT}]$, and will make a demand $s'(z) < \pi_{zT}\delta + k_D$. To see this, note that P_2 will choose π_2 to maximize

$$w_2(\pi_2; z) = \int_A (\pi\delta - k_P) f(\pi) d\pi / F(\pi_{zT}) + \tilde{s}(\pi_2)[F(\pi_{zT}) - F(\pi_2)]/F(\pi_{zT}),$$

where $A \equiv [\underline{\pi}, \tilde{\pi}_2]$ and $\tilde{s}(\pi_2) = \pi_2\delta + k_D$, subject to the constraint that $\pi_2 \geq \underline{\pi}$. Differentiating and collecting terms implies that the optimal value of π_2 is given by $\max\{\underline{\pi}, \pi_2'\}$, where $f(\pi_2')/[F(\pi_{zT}) - F(\pi_2')] = \delta/k$. Since $\pi_2' < \pi_{zT}$, P_2's optimal demand is $s'(z) = \max\{\underline{\pi}, \pi_2'\}\delta + k_D < \pi_{zT}\delta + k_D$. The marginal type π_{zT} is indifferent between accepting P_1's settlement demand and going to trial: $S_z' + \gamma_z s'(z) = 2[\pi_{zT}\delta + k_D]$. However, it must be that the type $\pi_{zT} + \epsilon$ (at least weakly) prefers T. By accepting P_1's settlement demand, $\pi_{zT} + \epsilon$ pays $S_z' + \gamma_z s'(z)$; however, by choosing T this defendant type pays $2[\pi_{zT}\delta + \epsilon\delta + k_D]$, which is clearly worse, leading to a contradiction. QED.

Claim 2. Defendant types in [$\underline{\pi}$, π_C*] are indifferent between configurations {*TC*} and {*TO*}, while defendant types in (π_C*, $\overline{\pi}$] strictly prefer {*TC*}.

Proof. Let $V^*(\pi;\ \gamma)$ denote the equilibrium payoff to the defendant of type π. For $\pi \in [\underline{\pi},\ \pi_C^*)$, the defendant of type π goes to trial against P_1 (and then settles with P_2) in both the {*TC*} and {*TO*} configurations, so $V^*(\pi;\ \gamma) = 2[\pi\delta + k_D]$, which is independent of γ. For $\pi \in [\pi_C^*,\ \pi_O^*)$, the defendant of type π settles with P_1 and goes to trial with P_2 in the {*TC*} configuration, but goes to trial against P_1 (and then settles with P_2) in the {*TO*} configuration. Thus, $V^*(\pi;\ \gamma_C) = (2 - \gamma_C)[\pi_C^*\delta + k_D] + \gamma_C[\pi\delta + k_D] \leq V^*(\pi;\ \gamma_O) = 2[\pi\delta + k_D]$, with equality only at $\pi = \pi_C^*$. For $\pi \in [\pi_O^*,\ \pi_2^*)$, the defendant of type π settles with P_1 and goes to trial with P_2 in both configurations, so $V^*(\pi;\ \gamma) = (2 - \gamma)[\pi^*(\gamma)\delta + k_D] + \gamma[\pi\delta + k_D]$, which is strictly increasing in γ for π in this range. Finally, for $[\pi_2^*,\ \overline{\pi}]$, the defendant of type π settles with both plaintiffs in both configurations, so $V^*(\pi;\ \gamma) = (2 - \gamma)[\pi^*(\gamma)\delta + k_D] + \gamma[\pi_2^*\delta + k_D]$, which is strictly increasing in γ for π in this range. Since *D* wants to minimize his loss, he prefers the configuration with the lower value of γ, which is {*TC*}. QED

Claim 3. The average plaintiff strictly prefers {*TO*} to {*TC*}.

Proof. $dU_P^*(\gamma)/d\gamma = dU_1^*(\gamma)/d\gamma + dU_2^*(\gamma)/d\gamma = -[\pi^*(\gamma)\delta + k_D][1 - F(\pi^*(\gamma))]$

$$+ \{[\pi^*(\gamma)\delta + k_D] - \gamma[\pi^*(\gamma)\delta - k_P]\}f(\pi^*(\gamma))\pi^{*\prime}(\gamma)$$

$$+ \int_B(\pi\delta - k_P)f(\pi)d\pi + [1 - F(\pi_2^*)][\pi_2^*\delta + k_D],$$

where $B \equiv [\pi^*(\gamma),\ \pi_2^*]$. The expression on the second line is positive. We collect the remaining terms and define the function $M(x) \equiv \int_A(\pi\delta - k_P)f(\pi)d\pi + [1 - F(\pi_2^*)][\pi_2^*\delta + k_D] - [x\delta + k_D][1 - F(x)]$, where $A \equiv [x,\ \pi_2^*]$. Notice that $M(\pi_2^*) = 0$ and $M'(x) = kf(x) - (1 - F(x))\delta$ (>,=,<) 0 as x (>,=,<) π_2^*. Thus $M'(x) < 0$ for $x < \pi_2^*$. Since $\pi^*(\gamma) < \pi_2^*$, it follows that $M(\pi^*(\gamma)) > 0$; *a fortiori*, $dU_P^*(\gamma)/d\gamma > 0$. QED

Claim 4. When P_1 may offer a menu of settlement demands, the following configurations cannot be equilibrium configurations: {*zT*}, *z* = *O*,*C*; {*TOC*}; {*OC*}; {*TCO*} and {*CO*}.

Proof. Claim 1 above argued that configurations of the form $\{zT\}$ could not be equilibrium configurations. Next, consider configuration $\{TOC\}$. Suppose, to the contrary, that there were such an equilibrium. Let π_{TO} denote the type which is (in equilibrium) indifferent between T and O, and let π_{OC} denote the type which is indifferent between O and C. Let S_O' and S_C' denote the equilibrium demands by P_1 which are associated with open and confidential settlements, respectively. Let $s'(T)$, $s'(O)$ and $s'(C)$ denote the equilibrium demands made P_2 following the disposition of P_1's suit. From our previous analysis, we know that $s'(T) = \pi\delta + k_D$ and $s'(C) = \max\{\pi_2^*, \pi_{OC}\}\delta + k_D$. Upon observing S_O', P_2 believes that $\pi \in [\pi_{TO}, \pi_{OC})$ and demands s to maximize:

$$w_2(\pi_2;O) = \int_A(\pi\delta - k_P)f(\pi)\mathrm{d}\pi/[F(\pi_{OC}) - F(\pi_{TO})] + \tilde{s}(\pi_2)[F(\pi_{OC}) - F(\pi_2)]/[F(\pi_{OC}) - F(\pi_{TO})],$$

where $A \equiv [\pi_{TO}, \pi_2]$, subject to the constraint that $\pi_2 \geq \pi_{TO}$; the other constraint, that $\pi_2 \leq \pi_{OC}$, will never bind and is therefore omitted. The solution to this problem is either at the lower boundary, implying $s'(O) = \pi_{TO}\delta + k_D$, or it is interior, implying $s'(O) = \pi_2'\delta + k_D$, where π_2' is defined by $f(\pi_2')/[F(\pi_{OC}) - F(\pi_2')] = \delta/k$. The crucial point is that $\pi_2' < \pi_{OC}$. Thus, $s'(O) < \pi_{OC}\delta + k_D$.

Consider the marginal type π_{OC}. If this type accepts the open settlement demand, then he pays $S_O' + \gamma_O s'(O)$. On the other hand, if he accepts the confidential settlement demand, then he pays $S_C' + \gamma_C[\pi_{OC}\delta + k_D]$ (either because P_2 settles with all defendants at $\pi_{OC}\delta + k_D$ following a confidential settlement with P_1 or because P_2 engages in further screening of these defendants, in which case the marginal type goes to trial against P_2). Thus, the defendant of type π_{OC} must be indifferent between these two options: $S_O' + \gamma_O s'(O) = S_C' + \gamma_C[\pi_{OC}\delta + k_D]$. In order for $\{TOC\}$ to be an equilibrium, the type $\pi_{OC} - \epsilon$ must (at least weakly) prefer O to C. For sufficiently small ϵ, accepting the open settlement demand yields the same payoff $S_O' + \gamma_O s'(O)$. However, accepting the confidential settlement demand yields the payoff $S_C' + \gamma_C[\pi_{OC}\delta - \epsilon\delta + k_D]$, since P_2 demands more than this defendant type is willing to pay to settle, resulting in a trial. Comparing these two payoffs indicates that the defendant of type $\pi_{OC} - \epsilon$ strictly prefers to accept the confidential settlement demand, which is a contradiction.

The same argument works for the configuration $\{OC\}$ since we can simply set $\pi_{TO} = \underline{\pi}$ in the proof above. Straightforward modifications also cover the cases of $\{TCO\}$ and $\{CO\}$. In the case of $\{TCO\}$, there will be marginal types π_{TC} and π_{CO}. P_2's demands will be $s'(C) < \pi_{CO}\delta + k_D$ and $s'(O) = \max\{\pi_{CO}, \pi_2\}\delta + k_D$. The marginal type π_{CO} is indifferent between accepting P_1's open settlement demand (and then either being pooled by P_2 at the demand $\pi_{CO}\delta + k_D$ or being asked to pay $\pi_2\delta + k_D$ and choosing trial instead) and P_1's confidential settlement demand: $S_O' + \gamma_O[\pi_{CO}\delta + k_D] = S_C' + \gamma_C s'(C)$. In order for $\{TCO\}$ to be an equilibrium, the defendant type $\pi_{CO} - \epsilon$ must (at least weakly) prefer to accept P_1's confidential settlement demand. Accepting P_1's confidential settlement demand yields the same payoff $S_C' + \gamma_C s'(C)$. However, accepting P_1's open settlement demand yields the payoff $S_O' + \gamma_O[\pi_{CO}\delta - \epsilon\delta + k_D]$, since P_2 demands more than this defendant type is willing to pay to settle, resulting in a trial. Comparing these two payoffs indicates that a defendant of type $\pi_{CO} - \epsilon$ strictly prefers to accept P_1's open settlement demand, which is a contradiction. QED

<u>Analysis of Joinder</u>

Suppose that joinder is modeled simply as handling the two cases simultaneously. Then each of the two plaintiffs makes a settlement demand (these will be the same since the plaintiffs' situations are symmetric) and, if the demand is rejected, each will go to trial. Each case is decided separately (though π is the same), and there may be small or no economies in trial costs, since each case involves case-specific attributes as well as some common ones.

Absent economies in trial costs, each plaintiff's expected payoff under joinder is the same as if she were the sole plaintiff against D. Let U_0^* be the optimized expected payoff to a single plaintiff. In this case, each plaintiff's optimal demand is given by $\pi_2^*\delta + k_D$, which is accepted by defendant types with $\pi \geq \pi_2^*$ and otherwise rejected. Thus,

$$U_0^* = \int_A (\pi\delta - k_P) f(\pi) d\pi + [\pi_2^*\delta + k_D][1 - F(\pi_2^*)], \text{ where } A \equiv [\underline{\pi}, \pi_2^*].$$

Consider the following variation on the previous model. P_1 becomes aware of D's potential liability and files suit. P_1 can either bargain alone with D or identify and contact P_2 (suppose this can be done at negligible cost) and join the cases. If P_1 bargains alone, she receives $U_1^*(\gamma_C)$, while if she contacts P_2, each plaintiff receives U_0^*. Notice that $U_0^* = U_1^*(1)$; since $U_1^*(\gamma)$ is decreasing in γ, it follows that $U_1^*(\gamma_C) > U_0^*$. Thus, P_1 would prefer to bargain alone rather than to contact P_2 and join the cases (assuming that economies in trial costs are sufficiently small).

Similarly, would P_2 desire joinder? That is, would P_2 prefer that P_1 bargain alone (recognizing that this will entail a probability $\gamma_C < 1$ of P_2 learning about D following a confidential settlement) or would P_2 prefer that P_1 identify and contact P_2 so as to join the suits? It is clear that $U_2^*(1) > U_0^*$; thus, if P_2 is sufficiently likely to discover D's involvement following a confidential settlement between D and P_1, then P_2 would also prefer that P_1 bargain alone rather than identifying and contacting P_2 so as to join the cases (again, assuming that economies in trial costs are sufficiently small). By waiting, P_2 benefits from the learning effect generated by P_1. Thus, we find that the sequential model is actually robust to allowing endogenous joinder, at least for some parameter values (note that γ_C can be made as close to 1 as necessary by increasing δ subject to maintaining Assumption 3).

In fact, being P_1 may (but need not) involve disadvantageous leadership. Clearly, if γ_C is relatively large then confidentiality is not worth much to D, and thus it is not worth much to P_1, while P_2 gets a large spillover. This can be seen by considering the extreme case wherein $\gamma_C = 1$. Here P_1 goes to trial against all D types with $\pi < \pi_2^*$, while P_2 settles with these types following P_1's trial (both P_1 and P_2 settle with all D types with $\pi \geq \pi_2^*$). Thus, $U_1^*(1) < U_2^*(1)$. On the other hand, it is also straightforward to verify that $U_1^*(\underline{\gamma}) > U_2^*(\underline{\gamma})$ if and only if $2[\pi^*(\underline{\gamma})\delta + k_D][1 - F(\pi^*(\underline{\gamma}))] > kF(\pi^*(\underline{\gamma}))$. Since $\pi^*(\underline{\gamma})$ can be made arbitrarily close to $\underline{\pi}$ by a judicious choice of parameters, and $F(\underline{\pi}) = 0$, this inequality can be made to hold, meaning that P_1 can be better off than P_2 if confidentiality is sufficiently effective in reducing the likelihood of a follow-on suit (relative to trial).