Online Technical Appendix for
"Revelation and Suppression of Private Information in Settlement Bargaining Models"
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*Screening Analysis of Settlement Bargaining*

We employ the following notation and assumptions; this analysis is analogous to Bebchuk (1984). P's type, d, is his private information; it is common knowledge that D's information about P's type is summarized by a continuous distribution F(•) on $[d_L, d_H]$, $d_L > 0$, with continuous density f(•) that is positive everywhere on $[d_L, d_H]$. We further assume that f(d)/F(d) is monotonically decreasing in d. P (respectively D) incurs court costs $c_P$ (respectively, $c_D$) if they go to trial; bargaining is assumed to be free. The probability that P will win at trial is exogenously fixed, is assumed to be common knowledge, and is denoted as λ, with $0 < \lambda < 1$. Assume that it is always credible for P to proceed to trial if she chooses to reject D's offer: $\lambda d_L > c_P$.

P accepts any offer, S, made by D if it is at least as good as her net payoff from going to trial, so for D's offer to be accepted it must satisfy:

$$S \geq \lambda d - c_P. \qquad (1)$$

D can be thought of as either choosing an S that induces a marginal type who is just indifferent between trial and settlement, or by directly choosing the marginal type, since (1) will hold as an equality and will be the offer D makes to settle.

D chooses the marginal type $d^M$ so as to minimize his expected costs (written for an arbitrary marginal type d):

$$F(d)(\lambda d - c_P) + \int(\lambda t + c_D)f(t)dt, \qquad (2)$$

where the integral runs from d to $d_H$. The first term in equation (2) is the expected cost of settlement with types in $[d_L, d]$, for an arbitrary type d; the second term reflects the expected cost of going to trial against types in $(d, d_H]$. All types at or below d accept $\lambda d - c_P$ while all those above d reject the demand and go to trial. To minimize the objective function in equation (2), we solve the first-order condition at $d^M$ (for now, assume there is an interior solution to the first-order condition):

$$f(d^M)(\lambda d^M - c_P) + F(d^M)(\lambda) - (\lambda d^M + c_D)f(d^M) = 0. \qquad (3)$$

Solving, we have the following condition for finding $d^M$:

$$f(d^M)/F(d^M) = \lambda/(c_P + c_D). \qquad (4)$$

Since the left-hand side is decreasing in its argument by an earlier assumption, then there is such an interior type if and only if $f(d_H) < \lambda/(c_P + c_D)$.[1] Thus, for example, as court costs increase, the right-hand-side of equation (4) decreases, making the solution to (4) move towards $d_H$, since f/F is monotonically decreasing. That is, as court become more costly to use, more types settle.

*Signaling Analysis of Settlement Bargaining*

We employ the same notation as above, but now the informed P makes a settlement demand, whereas the uninformed D makes an inference about P's type from the observed demand, and then decides whether

[1] We know that $f(d_L)/F(d_L) > \lambda/(c_P + c_D)$, since $f(d_L) > 0$ and $F(d_L) = 0$.

to accept or reject the demand. This analysis is analogous to Reinganum and Wilde (1986). Although there are typically many equilibria in signaling games, refinements such as D1 can be used to select among them; in this model, the sole surviving equilibrium is a fully-revealing one (see Reinganum and Wilde, 1986, for details); this is the separating equilibrium that will be characterized below.

A P of type d must make a settlement demand; thus, a strategy for P is a function s(d). When faced with a particular settlement demand S, D must form beliefs that assign a level of damages d to each demand S; these beliefs are denoted b(S). D must also choose a probability of rejection for each demand S; thus, a strategy for D is a function p(S).

Payoffs for P and D can be written as follows. The expected payoff for D when a demand S is made and he rejects it with probability ρ, given his beliefs b(S), is:

$$\Pi_D(S, \rho; b) = \rho(-\lambda b(S) - c_D) + (1 - \rho)(-S). \tag{5}$$

The first terms reflects the fact that D does not know d; rather, if he rejects the demand S, he believes that he will pay the amount $\lambda b(S) + c_D$. The expected payoff for a P of type d that demands S, given D's probability of rejection function p(S), is:

$$\Pi_P(d, S; p) = p(S)(\lambda d - c_P) + (1 - p(S))S. \tag{6}$$

In this case, the first term reflects the fact that P does know d, so she knows she will receive $\lambda d - c_P$ if her demand S is rejected.

A triple (b*, p*, s*) is a <u>separating equilibruim</u> if: (i) given the beliefs b*(S), p*(S) maximizes $\Pi_D(S, \rho; b^*)$; (ii) given the rejection function p*(S), s*(d) maximizes $\Pi_P(d, S; p^*)$; and (iii) b*(s*(d)) = d, for all d in $[d_L, d_H]$. Essentially, D is playing a "best response" to his beliefs b*(S); P is playing a "best response" to D's strategy p*(S); and D's beliefs are correct in equilibrium; that is, he infers the true d from P's equilibrium demand.

The separating equilibrium is derived as follows. Define $S_L = \lambda d_L + c_D$ and $S_H = \lambda d_H + c_D$. Then, regardless of D's beliefs at these demands, D should accept for sure any demand $S < S_L$ (since this is clearly less than what he would pay at trial against any type d in $[d_L, d_H]$) and he should reject for sure any demand $S > S_H$ (since this is clearly more than what he would pay at trial against any type d in $[d_L, d_H]$). For demands in $[S_L, S_H]$, the function p*(S) must be increasing in order to induce separation.[2] Moreover, the function p*(S) must be continuous for S in $[S_L, S_H]$ in order to induce separation; in particular, this implies that $p^*(S_L) = 0$.[3] But if p*(S) is increasing, then it must be interior (that is, strictly between 0 and 1)for S in $(S_L, S_H)$. But D is only willing to randomize if he is indifferent, and therefore $S = \lambda b^*(S) + c_D$ or, alternatively, $b^*(S) = (S - c_D)/\lambda$ for S in $[S_L, S_H]$. Since D's beliefs are correct in equilibrium, it must be that $s^*(d) = \lambda d + c_D$. In addition, it must be that $s^*(d) = \lambda d + c_D$ maximizes $\Pi_P(d, S; p^*)$. Differentiating equation (6) and collecting terms yields $p'(S)(\lambda d - c_P - S) + 1 - p(S) = 0$. Upon substituting $d = (S - c_D)/\lambda$, we obtain a differential equation for p as a function S, which is the strategy for D that we seek. D's equilibrium strategy p*(S) is the solution to the ordinary differential equation $p'(S)(- c_P - c_D) + 1 - p(S) = 0$, through the boundary condition

[2] Otherwise, types that are supposed to choose different demands in an interval on which p*(S) is constant or decreasing will all pool at the highest S in this interval.

[3] If there were an upward jump at some demand S in $[S_L, S_H]$, then a type d that was supposed to demand S in equilibrium could cut her demand very slightly and experience a discrete increase in the probability of settlement, which would induce this deviation. This argument does not hold for $S > S_H$ since there are no types that should make such a demand in equilibrium. Thus, there is an upward jump (up to 1) in the probability of rejection for $S > S_H$.

$p^*(S_L) = 0$. The solution is given by $p^*(S) = 1 - \exp\{-(S - S_L)/(c_P + c_D)\}$ for S in $[S_L, S_H]$. Finally, one can compute the equilibrium probability of trial for any P-type d as follows: $p^*(s^*(d)) = 1 - \exp\{-\lambda(d - d_L)/(c_P + c_D)\}$ for d in $[d_L, d_H]$.