Toward a Theory of Motion Practice and Settlement: A Comment

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Over the last five decades, the Law and Economics movement has thoroughly studied tort rules. It is fair to say that by now the costs and benefits associated with the major rules are well understood and have become expected knowledge taught worldwide in all of the major Law Schools. What is less well understood are the effects of different court procedures and practices on the outcome of trials and, therefore, their respective impact on the ex-ante incentives of potential tortfeasors. In particular, divergence of court procedures across legal systems may well generate for entire classes of problems very different outcomes and incentives despite an a-priori use of the same basic tort rule.

In that respect, the article by Scott Baker (2016) is a welcome endeavor to understand the relationship between pre-trial dispositive motions, settlements and discovery which are part of procedural rules commonly used in US courts. The paper starts by a very useful description of the litigation process under US federal law with an emphasis on the stage of discovery and on motion of summary judgements by the respective parties. The analysis proceeds by describing a stylized model designed to capture some of the key features of the litigation game and analyze settlement offers by defendants. Consistent with the objective of the paper, the setup presumes the parties have imperfect and asymmetric information. Moreover, the legal environment allows the defendant to file a motion for a summary judgement at different stages of the game.

A central element in Baker's model is a divergence between the defendant and the plaintiff on their respective evaluation of the impact of information revealed during the proceeding on the outcome of the trial. In the paper, this divergence is obtained by imposing two key assumptions which I will now describe in a slightly more general fashion than in Baker's analysis for the environment without discovery and pre-trial dispositive motions.

First, from the parties standpoint, the relevant information affecting the court's decision is summarized by a random variable $x \sim G(x;z)$ over the support $[0,1]$ where $z > 0$ denotes the respective parties' type. During a trial x is realized and commonly observed. For a given x, the defendant pays damage D depending on whether $x \gtrless \widehat{x}$ where $\widehat{x}$ is a commonly known value which is exogenously determined by the legal system.[1] Second, from the point of view of the defendant the plaintiff's type is unknown and perceived as a random variable $z \sim F(z)$. Consider the following assumptions;

Assumption 1: $G(x;z) = [H(x)]^z$ where $H(\cdot)$ is a distribution over the support $[0,1]$.

Assumption 2: It is common knowledge that $z = 1$ for the defendant.

Assumption 3: The distribution $F(z)$ is log concave.

Assumptions 1 and 2 generalize Baker's setup in two ways. First, it allows for pessimistic ($z < 1$) as well as optimistic plaintiffs ($z > 1$).[2] Second, Baker only considers a very specific quasi uniform distribution.[3] More generally, it should be possible to avoid the specific functional form imposed by Assumption 1 by requiring that $G(x;z)$ satisfies MLRP. Assumption 3 is the same as in Baker.

To keep notation to a minimum and slightly abusing notation, I define the ex-ante probability perceived by the defendant that he will win a trial by $\widehat{H} = H(\widehat{x})$. In contrast, a plaintiff of type z will expect to win with probability $1 - \widehat{H}^z$. Accordingly, the z-type plaintiff will determine whether to accept or reject a settlement offer s by comparing it to $\left(1 - \widehat{H}^z\right) D - c^p$ where the first term measures expected damage payments and c^p denotes the plaintiff's court fees. Assuming as in Baker that D is normalized at 1 and letting $\widehat{z}(s, \widehat{H})$ designate the critical plaintiff which is indifferent between accepting the settlement offer and going to trial, we obtain:

$$\widehat{z}(s, \widehat{H}) = \frac{\ln(1 - c^p - s)}{\ln \widehat{H}} \; . \tag{1}$$

Accordingly, plaintiffs that are more pessimistic than the critical type (i.e.

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[1] For ease of the ensuing notation, I changed the representation of the critical value from x^c to $\widehat{x}$.

[2] Clearly, there is no obvious reason why plaintiffs should be more optimistic than defendants as in Baker (2017). In fact, in the numerical example presented below the critical plaintiff who is just indifferent between accepting the optimal settlement offer and going to court turns out to be characterized by $z < 1$. In the current model means he less optimistic than the defendant.

[3] Specifically, in Baker's model $g(x;z) = x \pm z$ depending on $x \lesseqgtr 1/2$ and where $z \in [0,1]$ for plaintiff and $z = 0$ for defendants.

$z \leq \widehat{z}(s, \widehat{H})$) will accept s while more optimistic individuals will prefer going to trial. A rational defendant will predict this behavior. Hence, he will expect settling with probability $F[\widehat{z}(s, \widehat{H})]$ and going to court otherwise. In the latter case, he anticipates the legal fees c^d and expected damage payment, $\left(1 - \widehat{H}\right)$. Hence the defendant can solve for the settlement offer which minimizes his total expected costs, i.e.

$$C(s, \widehat{H}) = s \cdot F[\widehat{z}(s, \widehat{H})] + \left(1 - \widehat{H} + c^d\right) \cdot \left(1 - F[\widehat{z}(s, \widehat{H})]\right) \ . \qquad (2)$$

Dividing the first-order condition of (2) with respect to s by $f[\widehat{z}(s, \widehat{H})]$, we find that the defendant's optimal settlement offer, $s^*(\widehat{H})$, is implicitly defined by the solution to the equation:

$$\frac{F\left[\widehat{z}(s, \widehat{H})\right]}{f\left[\widehat{z}(s, \widehat{H})\right]} - \frac{s - \left(1 - \widehat{H}\right) - c^d}{(1 - c^p - s) \ln \widehat{H}} = 0 \ . \qquad (3)$$

Substituting $\widehat{z}(s, \widehat{H})$ from (1) and taking derivative with respect to s we find that the left-hand ratio is increasing in s. Assuming that $c^d + c^p < \widehat{H}$ ensures that the right-hand ratio is decreasing in s. Note that the requirement simply states that total court fees are less than the defendant's expected damage costs. With appropriate boundary conditions, this verifies that the basic model has a unique solution which concludes the description of the setup without discovery and pre-trial dispositive motions.

The next step in Baker's analysis is to extend the basic framework by introducing – after a first rejection of a settlement offer – a discovery stage followed by the possibility of a motion for a summary judgment. In case of no motion or if it is denied, the defendant can make an additional post-discovery settlement offer. Applying backward induction, consider the defendant decision for a post discovery settlement offer.

At that stage, the information revealed during discovery allows all the parties to update their information. Mathematically, this can be captured by assuming that the parties perceive $x \sim \widetilde{G}(x; z) = [\widetilde{H}(x)]^z$ over the support $[0, 1]$. Hence, except for the change in the parties information, the problem remains exactly the same as the one described above. Accordingly, the defendant will make the settlement offer $s^*(\widetilde{H}(\widehat{x}))$.

In Baker's analysis, the parties find out during discovery whether $x \in [0, \frac{1}{2})$ or $x \in \left[\frac{1}{2}, 1\right]$. Hence, by updating the parties learn whether the post-discovery distribution *First-Order Stochastically Dominate* (FOSD hereafter) the pre-discovery distribution or whether the reverse holds. In the current extension, this can be generalized by assuming that discovery either reveals that $\widetilde{H}(\cdot)$ FOSD $H(\cdot)$ or that the reverse holds.

To fully solve an extended version of Baker's model and determine the defendant's pre-discovery settlement offer, one would now need to describe the judge's decision rule on a motion of summary judgement and, furthermore, introduce an assumption over the set of possible post-discovery distributions.[4] Clearly, this goes beyond the scope of this short comment. Nevertheless, even without a full description of the model the setup suggests some straightforward intuitions.

For instance, consider proposition 2 in Baker's analysis and suppose that post discovery the judge rejected a motion for a summary judgement in favor of the defendant. Clearly, one would expect that the information revealed during discovery was not favorable to the defendant. In the model that I described, this would suggest $\widetilde{H}(\widehat{x}) < H(\widehat{x})$. Applying the implicit function theorem to (3) and using the equality $s = 1 - \widehat{H}^{\overline{z}} - c^p$, we have:

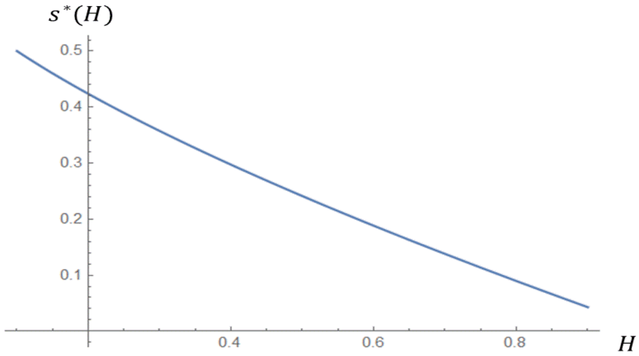
$$\frac{ds^*}{d\widehat{H}} = \frac{\frac{\widehat{H}^{\overline{z}} - \widehat{H} + c^d + c^p + \widehat{H}\ln\widehat{H}}{\widehat{H}\left(\ln^2\widehat{H}\right)(1 - c^p - s)} - \frac{d}{dz}\left[\frac{F(\widehat{z})}{f(\widehat{z})}\right]\cdot\widehat{z}_H}{C_{ss}\cdot f\left(\widehat{z}\right)} \tag{4}$$

By construction, the denominator in (4) must be positive since it is the second-order condition of a minimization problem. For the general case, the sign of the numerator in (4) is ambiguous though; $\frac{d}{dz}\left[\frac{F(z)}{f(z)}\right] > 0$ by Assumption 3 and by (1) $\widehat{z}_H = -\frac{\ln(1-c^p-s)}{\widehat{H}\ln^2\widehat{H}} > 0$,[5] but the sign of the denominator in the first fraction remains undetermined unless further conditions are imposed. Nevertheless, one would expect the term $\widehat{H}^{\overline{z}} - \widehat{H} + c^d + c^p$ to be fairly small. For instance, in the Baker analysis, the critical plaintiff is an optimist which implies $\overline{z} > 1$ in the current version of the model. This would imply $\widehat{H}^{\overline{z}} - \widehat{H} < 0$. Moreover, $c^d + c^p$ measures the court fees relative to the damage which has been normalized at $D = 1$. Hence, $c^d + c^p$ should relatively small. Altogether, it seems reasonable that for most cases the first fraction becomes negative which would imply $\frac{ds^*}{d\widehat{H}} < 0$.

For the purpose of this comment, I did not search for a condition which would ensure the suggested conclusion. Instead, I consider a specific example with $F(z) = 1 - e^{-z}$. With all the functions specified, I used Mathematica to draw the associated $s^*(\cdot)$ function represented in the figure below.

[4] In Baker's environment, this follows by the very restrictive structure of discovery which either reveals $x \in [0, \frac{1}{2})$ or $x \in \left[\frac{1}{2}, 1\right]$ and the additional requirement $\widehat{x} \in \left[\frac{1}{2}, 1\right]$.

[5] *Ceteris paribus*, information that is more favorable to the defendant implies that more plaintiffs should accept a given settlement offer.



As one would expect, we find that after the rejection of a motion for summary judgement in favor of the defendant, the latter perceives that his case is poor and increases the settlement offer. This suggests that Baker's findings of proposition 2 could be extended to a much larger class of environments.

The above logic also suggests a diametrically symmetric finding for the case where the plaintiff files for a motion which is rejected by the court. Finally, intermediary cases where the parties engaged in discovery, but neither side filed for a summary judgement could also be analyzed within this framework. Altogether, even though the scope of Baker's (2016) findings may appear somewhat limited due to fairly restrictive assumptions that have been imposed to simplify the analysis, I believe that an extension of the model will verify the generality of the central conclusions and their intuition.

Bibliography

Baker, Scott (2016): "Toward a Theory of Motion Practice and Settlement", *Journal of Institutional and Theoretical Economics,* to appear.