Of hired guns and ideologues: why would a law firm ever retain an honest expert witness?[1]

Martin Richardson[2]

August 2021

[1]This work was commenced while I was visiting Hitotsubashi University, UBC and the University of Tübingen and I am grateful to these institutions for their hospitality. I also thank Nisvan Erkal, Ngo Van Long and Kathryn Spier for helpful discussions and comments on earlier drafts, and seminar participants at the ANU, the University of Melbourne and the University of Tübingen. All remaining errors are, of course, my own.

[2]Research School of Economics, The Australian National University, Canberra ACT 2601, Australia. Email: martin.richardson@anu.edu.au.

Abstract

We suppose that expert witnesses are, generically, either honest in their assessment of a fact situation or are mercenary 'hired guns' that advocate for their retaining party. The type of a witness is known to law firms, who engage with them repeatedly, but not to courts. If the only way an honest witness can credibly reveal their type to a court is by siding with the opposing party then the question arises of why a law firm would ever retain an honest expert. We show that it can act as a signaling device in a game between the law firms to communicate private information regarding a party's confidence in winning the case. Our results indicate, amongst other things, that the 'English' rule of costs allocation can make a socially desirable separating equilibrium less likely, compared to the 'American' rule.

JEL Classification: K41, D82, C72

Keywords: expert witnesses, signaling, litigation.

1 Introduction

Consider a court case in which the evidence and analysis of the parties' expert witnesses is important. Indeed, suppose it is pivotal and the whole case turns upon it. To be concrete, consider two potentially merging firms who are appealing a decision by a national competition authority declining merger approval, so the firms constitute the plaintiff (P) and the competition authority the defendant (D).

We suppose that there are three generic sorts of expert witnesses. The first are honest experts (H) who assess the information and situation before them and provide their honest opinion on which party should prevail.[1] The second are hired guns (G) who will testify in favor of their retainer, regardless of the facts before them, be they plaintiff or defendant. The third are ideologues: these are effectively ethical hired guns in that they have arrived legitimately at a particular position and adhere to it no matter what, so they are available for hire only by one side in the case. For instance, "[a] perfectly respectable economist might be an antitrust "hawk," another equally respectable economist a "dove." Each might have a long list of reputable academic publications fully consistent with systematically pro-plaintiff or pro-defendant testimony" [18, Posner, 1999, p.96].

Before a trial is initiated, each party has some sense of their likely success in the case. If the case does go to court then they will retain an expert witness. Presentation of evidence and cross-examination in the trial process is assumed to refine a witness' analysis of the

[1] Many countries require expert witnesses to sign an undertaking to operate in the interests of the court, not their retaining party. For example, the Canadian Code of Conduct for Expert Witnesses states, '1. An expert witness named to provide a report for use as evidence, or to testify in a proceeding, has an overriding duty to assist the Court impartially on matters relevant to his or her area of expertise. 2. This duty overrides any duty to a party to the proceeding, including the person retaining the expert witness. An expert is to be independent and objective. An expert is not an advocate for a party.' [11, Government of Canada, 2015]. Similarly, the New Zealand Expert Witnesses Code of Conduct states, 'Duty to the Court. 1. An expert witness has an overriding duty to assist the Court impartially on relevant matters within the expert's area of expertise. 2. An expert witness is not an advocate for the party who engages the witness. ' [17, Parliamentary Counsel Office of New Zealand, 2016]. Australia has very similar provisions. [9, Federal Court of Australia, 2016]. Posner notes that in the U.S., "[t]he law governing the use of expert witnesses...is set forth in Article VII of the Federal Rules of Evidence" [18, Posner, 1999, p.92], but these Rules make no explicit statement regarding any non-advocacy role of expert witnesses. The relevant rule – 702 (see, e.g., `https://www.law.cornell.edu/rules/fre/rule_702`) – was amended in 2000 in response to Daubert v. Merrell Dow Pharmaceuticals, Inc. [5] and subsequent case law but, other than requiring a court to be sure that the expert, 'employs in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field', does not seem to directly address the issue of advocacy.

case[2], perhaps through the revelation of new information, so the essential difference in court between an H on the one hand and hired guns and ideologues on the other is that there is some possibility that the former's view will change in court, whereas there is no chance that the latter's will. In this sense, hired guns and ideologues are observationally equivalent and we shall lump them together henceforth as Gs.[3]

It is reasonable to suppose that the legal firms representing the two parties specialize in these kinds of cases and, over the years, have come to learn the nature of potential expert witnesses. That is, they know if an expert is an H or a G. The court, on the other hand, is less likely to know this, due to a lack of frequency of such cases (which may be due to a lack of specialization by judges or because the cases are heard before necessarily different juries) and hence a lack of familiarity with the set of experts; we suppose it is completely uninformed *ex ante*. As noted (see footnote 1), the formal role of expert witnesses in court is typically to assist the court in making the correct decision and in many common law jurisdictions an expert witness must sign an affidavit to the effect that they will not be an advocate but, essentially, an officer of the court. Consequently, we suppose that the court would like to identify an expert's type, if possible, to inform its findings: an identified G provides the court with no information because, whether they believe it or not, such an expert will simply validate the views of their retaining party, whereas an identified H has greater credibility for the court. There is a risk in retaining a G, however, and that is that they may be exposed as such during the trial and their testimony perceived as useless, or worse.[4]

---

[2]Spier notes, in discussing the "optimism framework" of analysis of litigants' beliefs, that, "[i]n reality, many litigants – especially those with skilled lawyers – update their beliefs over time as new information emerges. They learn about the underlying merits of the case" [22, Spier, 2007 p.278]. A key feature of expert witnesses, in contrast to ordinary witnesses, is that they can provide *opinion* in testimony – to the extent that that opinion is informed by their expertise – rather than simply relate factual content as they perceive or experience it. Such opinion is much more likely to adjust with discovery, cross-examination and argument in court than is pure factual testimony, and this is what we allow here.

[3]Whilst the term "hired guns" has derogatory connotations, none are intended with respect to the ideologues included henceforth in that term.

[4]It is a commonplace tactic for counsel, in final summations, to suggest that their rival's experts have been partisan advocates, rather than acting in the interests of the court. This is frequently dismissed by courts: Veljanovski [23, 2009] cites an English judgment in which the judge remarked,

> "[Counsel's] submissions on this come down to the proposition that ... I should assume that there is a material risk that [the expert witness] would, by his evidence, be dishonestly advancing an economic case he knew to be untrue in order to better the interests of the claimants. Indeed, in his closing submissions ...[counsel] submitted that [the witness] was

Of course, because the parties pre-screen their experts, they will never come to court with an expert who disagrees with their position. So each presents to the court an (initially) affirming witness. The problem a court faces is how to distinguish the types of witnesses before them. A G might be revealed (see footnote 4) but the only way in which it can accurately identify an H is if the witness alters their position during the trial. But such a revelation of an H is anathema to their retainers. So our titular question arises in this setting: if the court cannot distinguish an H from a G unless the former 'flips' in court, why would a law firm ever retain an honest expert?

The answer explored here is that retaining an H is a signal not to the court, but to the other litigating party. Suppose, reasonably, that the probability of an H flipping in court is inversely related to their initial confidence in winning. Consequently, the danger of the H switching sides is relatively small when a party is very confident. If signaling that confidence to the rival can be beneficial – for example, by reducing the effort the rival puts into litigation or, as in the model here, by reducing the chance that they will appeal should they lose in the court of first instance – then there might be an equilibrium in

---

> "part of the home team. He was a safe pair of hands. He could be relied upon to find [firm A] dominant and abusive." These are harsh submissions and I do not regard them as carrying the day."

But courts do stress the importance of the experts adhering to their roles and will dismiss the usefulness of those perceived to be partisan advocates. Consider the following from a judgment of the Australian Competition Tribunal:

> Generally, whether an expert's opinion is confined to his or her area of expertise and whether experts state the factual basis upon which they have formed their opinion, are useful considerations in determining at what point an expert witness ceases to be impartial and has moved beyond the bounds of legitimacy into advocating for a party. Another indicator is the willingness of an expert to respond to questions whose answers may provide support for a view which is contrary to the interests of the party calling them. With regard to the latter, we note that on many occasions in the present proceeding two experts in particular ... appeared reluctant to respond to questions whose answers might have been adverse to the case put by the party calling them. Instead, they provided non-responsive answers and deviated to discussions of other issues which supported the case of [their retaining parties] ... Such an attitude and conduct of an expert witness leads to a conclusion of partiality and an inability to express an objective expert opinion upon which reliance can be placed. Further, a number of [...]'s comments in relation to the applicants' case ... gave us no confidence that we could rely upon him for independent expert testimony.
> [2, Australian Competition Tribunal, 2004, ¶221-3.]

The 'exposure' of an ideologue also involves an inference of, 'an inability to express an objective expert opinion' in the same way, albeit without any pejorative overtones.

which a confident law firm retains an honest witness to deter their rival in some fashion.

The role of expert witnesses has had significant discussion in the legal literature[5] but very little in economics. One exception is [18, Posner, 1999] which discusses a number of issues surrounding the use of economic experts in court but largely circumvents the issues focused upon here. He considers the oft-voiced concern that experts might simply be hired guns, but dismisses it as likely to be irrelevant in a well-functioning experts market, largely because of the career incentives facing the experts themselves. Our model suggests that one might be somewhat less sanguine about this, as it indicates that the demand for hired guns might be significant, in some cases. There are a number of lines of literature related to the issues addressed here, such as reputations with career concerns – see [3, Bar-Isaac and Deb, 2014] for a recent contribution – decisions to terminate or continue proceedings [14, Kaplow, 2013] [22, Spier, 2007], persuasion in sender-receiver games [13, Kamenica and Gentzkow, 2011], [10, Gentzkow and Kamenica, 2017], strategic behavior by biased experts [15, Kartik *et al*, 2017], [16, Krishna and Morgan, 2001], [1, Alonso and Câmara, 2018], disclosure decisions in court [4, Che and Severinov, 2017] and the value of advocacy [7, Dewatripont and Tirole, 1999]. A key feature of the present model that distinguishes much of this literature, however, is that the experts here are entirely non-strategic: they either evaluate the information before them honestly or not and this is purely a function of their type, H or G. The strategic behavior comes from their retainers, the law firms, so we do not have a classic sender-receiver structure between the lawyers and the experts.[6] Furthermore, we do not address the question of litigation versus pre-trial settlement; we take the decision to litigate as given (perhaps occurring at an earlier, unmodeled, stage.)

[5] It is a long-standing and not always positive discussion, too. Learned Hand, in an article on precisely this topic published in 1901 whilst he was a lawyer in practice in Albany, NY, remarked that, "[t]here are two things I wish to prove: first, that logically the expert is an anomaly; second, that from the legal anomaly serious practical difficulties arise."[12, Hand, 1901 p.50.]

[6] "In the canonical Bayesian persuasion model, a Sender designs an information structure to influence the behavior of a Receiver. The Sender is Bayesian, and has beliefs over the Receiver's prior information as well as the additional information sources the Receiver may attain to after observing the realization of the Sender's signal. As a result, the Sender's optimal signal typically depends on the details of her belief about the Receiver's learning environment" [8, Dworczak and Pavan, 2020, p.1]. The natural way to view the current model is to think of the expert as the Sender and their retaining law firm as the Receiver, but then, as noted, the Sender is non-strategic and their behavior does not hinge on any beliefs about the nature of the Receiver. An alternative way to fit this model into the Bayesian Persuasion structure is to think of each law firm as the Sender to its rival's Receiver.

2 The model

We have two risk-neutral players, P (the Plaintiff's law firm) and D (the Defendant's law firm) and each initially receives a signal, $x \in \{0, 1\}$, regarding their probability of success in litigation.[7] The true state of the world is denoted $s \in \{0, 1\}$ where $s = 0$ is the case where the defendant D is "right" and $s = 1$ is the case where plaintiff P is correct. The two states are equally likely[8] *ex ante* and this is common knowledge. Each player $i \in \{P, D\}$ receives a signal concerning the probability that $s = 1$ denoted x^i_j where $j \in \{0, 1\}$ indicates if the signal is 0 or 1. The signal generating function is such that in state $s = j$ the probability of x^i_j is ρ and the probability of $x^i_{\neg j}$ is $1 - \rho$. That is, $Pr\left(x^i_1|s = 1\right) = Pr\left(x^i_0|s = 0\right) = \rho$; $Pr\left(x^i_0|s = 1\right) = Pr\left(x^i_1|s = 0\right) = 1 - \rho$, so ρ is a measure of the accuracy of the signal and we assume that $\rho \in (0.5, 1)$.[9] , [10] From Bayes' Rule,
$Pr\left(s = 1|x^P_1, x^D_1\right) = \frac{\rho^2}{\{\rho^2+(1-\rho)^2\}} \equiv \rho_1 > \rho$;
$Pr\left(s = 1|x^P_0, x^D_0\right) = 1 - \rho_1$;
$Pr\left(s = 1|x^P_1, x^D_0\right) = Pr\left(s = 1|x^P_0, x^D_1\right) = \frac{1}{2}$.

[7]One way to think of this process is that each firm initially consults privately with an expert known to them to be honest and derives this expectation that way.

[8]There is nothing essential to our argument in the 50-50 balance but it coincides with the modeling of an honest expert in the following sense: such an expert provides an objective assessment of the probability of winning a case but makes no calculations of expected gains and losses from litigating. While even a risk-averse law firm might be willing to litigate a case they believe they have only, say, a 30 per cent chance of winning, if the rewards from success are sufficiently high, an honest expert in such a context would declare that the other party is more likely to be correct. The 'critical' value for an honest expert to recommend a viewpoint is that it is at least 50 per cent likely to be correct. The simplifying 50-50 assumption also economises on algebra.

[9]When ρ gets very close to one the signals become, essentially, fully informing. In such a case we would anticipate that an unconfident party, certain of losing, will not proceed to court. Rather than complicate the analysis further by adding a preliminary "settle or litigate" stage, we assume instead that ρ is not "too high". We discuss this further in Appendix A.3 .

[10]Some handy probabilities follow from this:
$Pr\left(x^P_1, x^D_1|s = 1\right) = Pr\left(x^P_0, x^D_0|s = 0\right) = \rho^2$;
$Pr\left(x^P_0, x^D_0|s = 1\right) = Pr\left(x^P_1, x^D_1|s = 0\right) = (1 - \rho)^2$;
$Pr\left(x^P_0, x^D_1|s = 1\right) = Pr\left(x^P_1, x^D_0|s = 1\right) = Pr\left(x^P_0, x^D_1|s = 0\right) = Pr\left(x^P_1, x^D_0|s = 0\right) = \rho(1 - \rho)$.
So, given $Pr(s = 1) = Pr(s = 0) = \frac{1}{2}$, we have unconditional probabilities:
$Pr\left(x^P_1, x^D_1\right) = Pr\left(x^P_0, x^D_0\right) = \frac{1}{2}\left\{\rho^2 + (1 - \rho)^2\right\}$ and $Pr\left(x^P_1, x^D_0\right) = Pr\left(x^P_0, x^D_1\right) = \rho(1 - \rho)$.

2.1 Timing

The timing of the game is as follows. First, Nature selects a state and each player receives a signal, as just described. The players then simultaneously decide on their expert, choosing an H or a G, and the trial, before the court of first instance, begins. In the trial process, experts reassess their analysis and any H (G) expert flips (is exposed) or not. If a single H flips or a single G is exposed then their side loses the case, due to the pivotal nature of the expert evidence[11], and we suppose that no appeal is then feasible: the party has lost credibility and, consequently, leave to appeal will not be granted. If either no or both[12] experts flip or are exposed then the court decides the case but, as it is then uninformed as to the nature of the experts' types, so its decision is essentially a coin toss. The loser in the court of first instance may then initiate an appeal or not; if they do then the other party may choose to settle the case and pre-empt the appeal; failing that the appeal court hears and decides the case.[13]

To flesh out some details of this process, we do not explicitly model the trial process and an honest expert's reassessment of the case, but simply assume that the probability of an honest expert reversing their position in court is inversely related to the likelihood, conditional on the signals, that the state of the world favors their party. To make this concrete we assume that, if the probability of a party winning, conditional on the two parties' signals, is z, say, then the probability of their H expert flipping their position in court is just 1-z. Second, there is some exogenous probability, τ, that any given G expert will be exposed in court as being in violation of their objectivity undertaking. In practice

[11] In the separating equilibrium this is consistent with a Bayesian court, as the exposure of a G reveals an unconfident party, and an H that flips also reveals that their retainer's chance of success is less than a half.

[12] If both experts are rendered irrelevant, we assume that the court simply ignores them. This is a point that Posner [18] raises as a potential problem with the use of expert witnesses and there is judicial precedent for doing just this: in [19, RPC, 2000, pp168-9] Farris J observed that the testimony of the expert econometrician witnesses was of limited assistance due to its technical nature and concluded that, having regard to the fact that, "there was little common ground between them,..., the highly technical nature of the statistical discipline which was being applied, the limited scope of the underlying data,..., we do not feel able to prefer the evidence of one of the experts to that of the other."

[13] The role of the appeal court in this model mirrors that of Shavell: "...if litigants possess information about the occurrence of error [in the court of first instance] and appeals courts can frequently verify it, litigants may be led to bring appeals when errors are likely to have been made but not otherwise." [21, Shavell, 1995, p.381].

this is small and we assume throughout the paper that it is less than 25%.[14] Third, the appeal court is assumed to be more accurate than the court of first instance, but it is not omniscient; to be precise, we assume that it decides in favor of the party that is objectively most likely to be right on the basis of the best information available, i.e. in light of *both* the signals received, which we assume are revealed to it in its processes.[15] Importantly, if the appeal court has no grounds on which to overrule the initial court's decision then it will not. In particular, this means that if its best estimate of the state of the world is 50-50 then an appeal will fail: it has no basis on which to overturn the finding in the court of first instance and so will not.

2.2 Payoffs

We suppose that the parties' court costs are the same, at f_C and f_A each in the first court and the appeal court respectively. The loser of the case overall bears a proportion $(1+\lambda)$ of the costs – their own costs plus a fraction λ of the winner's – and the winner pays the fraction $(1-\lambda)$. As a rough approximation one can think of $\lambda = 1$ as representing the 'English' situation in which the loser of the case has costs imposed on them and $\lambda = 0$ as the 'American' arrangement wherein costs lie where they fall. If we let π^i_{kr} denote the payoff to player[16] $i \in \{P, D\}$ from outcome $r \in \{W = \text{win}, L = \text{loss}\}$ in forum $k \in \{C = \text{Court of first instance}, A = \text{Appeal court}\}$ then:

[14] One could endogenize this probability as some function of effort taken by the retaining party in briefing and rehearsing their expert and so on. In general one would expect to observe some $\tau(Pr(win))$ where $\tau' < 0$ and, in the current setup in which, in the Court of first instance when this exposure might occur, a party's prior $Pr(win)$ is either ρ or $1-\rho$ so an endogenized τ would take on one of only two values. In the separating equilibrium that we stress below this would, in fact, be just a single value.

[15] Our appeal court is Bayesian but is modelled in quite a reduced form in comparison to those in the literature that explicitly analyse the appeals process, such as Daughety and Reinganum [6]. In particular, our court draws no inferences about the state of the world from the *fact* of an appeal, as it does not need to: it simply makes its decision on the basis of the aggregate information available to the parties.

[16] It is best to think of these payoffs as those accruing to the law firms, not their employers, the litigating parties (although they are likely to be related, in practice.) The reason is that, particularly in a competition law case, the payoffs to the parties will be very essentially intertwined with the state of the world i.e. whether P or D *should* win the case. In a merger, for example, the key element in determining its approval or not in most jurisdictions is the calculation of whether or not its net social benefits are positive, but these are likely to be at least closely related, if not identical, to the 'losses from losing' for the competition regulator, or D in our motivating example.

$$\begin{array}{ll} \pi^i_{CW} = W^i - (1-\lambda)f_C & \pi^i_{AW} = W^i - (1-\lambda)(f_C + f_A) \\ \pi^i_{CL} = -L^i - (1+\lambda)f_C < 0 & \pi^i_{AL} = -L^i - (1+\lambda)(f_C + f_A) < 0 \end{array}$$

We suppose that $\pi^i_{AW} > 0$ so a party would always prefer to appeal a loss if it were guaranteed to win the appeal.[17] Thus $\pi^i_{CW} \geq \pi^i_{AW} > 0 > \pi^i_{CL} > \pi^i_{AL}$. Finally, we assume that $\pi^i_{CW} + \pi^i_{CL} \geq 0$, which means each party gains at least as much from a win as it loses from a loss: it would accept a 50-50 chance in court.[18]

This structure offers a number of appealing features in terms of manageability. As the final act in the game, there is no strategic component to an appeal or a settlement decision – the decision to initiate this or not simply depends on expected gains and losses at that point, as discussed more completely next. There is also nothing strategic about the behavior of the experts, as noted earlier: their type dictates their behavior, regardless of context. Finally, as we shall see, at any decision node there are only three possible beliefs a player can rationally hold about their chance of success: ρ_1, $\frac{1}{2}$ or $1 - \rho_1$.

2.3 Appeals

Turning to the appeals process, suppose player P, for example, has lost in court and believes that their probability of success on appeal (i.e. $Pr(s = 1)$) is, say, ρ^P. Their expected payoff from an appeal is then $E\pi^P_A = \rho^P \pi^P_{AW} + (1 - \rho^P)\pi^P_{AL}$ which compares with π^P_{CL} from not launching an appeal. Rearranging, it will be worth launching an appeal *iff*:

$$\rho^P \geq \underline{\rho^P} \equiv \frac{\pi^P_{CL} - \pi^P_{AL}}{\pi^P_{AW} - \pi^P_{AL}} = \frac{(1+\lambda)f_A}{W^P + L^P + 2\lambda(f_C + f_A)}.$$

A similar exercise for D establishes that, where ρ^D also represents their belief that $s = 1$ (so their probability of winning is $1 - \rho^D$) it is worthwhile D appealing a loss in court *iff*:

$$\rho^D \leq \overline{\rho^D} \equiv \frac{\pi^D_{AW} - \pi^D_{CL}}{\pi^D_{AW} - \pi^D_{AL}} = \frac{W^D + L^D + \lambda(2f_C + f_A) - f_A}{W^D + L^D + \lambda(2f_C + f_A) + \lambda f_A}.$$

[17] If $\lambda = 1$ then this restriction is irrelevant, but for $\lambda < 1$ it requires that $f_A + f_C < \left(\frac{W^i}{1-\lambda}\right)$.

[18] See the discussion in footnote 8. This assumption amounts to a restriction on the size of the costs of initial court proceedings such that $f_C \leq \frac{1}{2}(W^i - L^i)$ and so requires, if f_C is strictly positive, at least that $W^i > L^i$.

The interesting case here is where a party will appeal only if they are relatively confident of success[19] so we assume that parameters are such that the following holds:

$$0 < (1-\rho) < \overline{\rho^D} < \frac{1}{2} < \underline{\rho^P} < \rho < 1 \qquad (\star)$$

Given the structure of the appeals process, there will be cases in which both parties recognize that an appeal will be launched and will succeed. In such a scenario we allow that, after the first court decision has been made, the initially successful party, anticipating that it will be an unsuccessful respondent to an appeal, may choose to settle the case. We model this settlement process as a take-it-or-leave-it offer of the amount S by the potential respondent to the potential appellant. If the appeal proceeds then appellant i will receive π^i_{AW} so respondent j can offer $S(j) = \pi^i_{AW}$ and this will be accepted[20]. This payoff to j of $-\pi^i_{AW}$ is potentially attractive to j as it can effectively avoid some of the costs of an appeal: the alternative is a payoff of π^j_{AL} which will be worse if the following condition holds, as we assume henceforth:[21]

$$\pi^j_{AL} + \pi^i_{AW} < 0 \iff f_A > \frac{1}{2}(W^i - L^j) - f_C$$

3 An equilibrium

Our equilibrium concept here is Perfect Bayesian Equilibrium (PBE) and, as mixed strategies are not compelling in this setting, we confine our attention to symmetric pure strategy equilibria alone. We conjecture the following separating equilibrium: a player chooses an H expert if they get an encouraging signal (x^P_1 for P and x^D_0 for D) and a G otherwise; a loss in court is appealed by a player if and only if they believe their chance of winning is ρ_1; an appeal by a rival is settled if and only if the potential respondent believes the

[19]If a party either always or never appeals, regardless of their confidence, then there is no rationale for the other party to endeavour to communicate its own degree of confidence to its rival.

[20]Either by a tie-breaker assumption or with the offer of some infinitesimal ϵ more than this amount.

[21]If the payoffs are symmetric across the parties then this condition implies that our risk-neutral parties would not choose to appeal if they had a 50-50 chance to win. But the appeal court would not uphold an appeal in such a circumstance anyway: in keeping with the actual practice of appeal courts in many jurisdictions, they will not overrule a lower court without strictly positive grounds to do so. In the model here, an appealable decision in the court of first instance is always made on a 50-50 basis and so would not be overturned unless the true probabilities strictly favor one of the parties.

appeal will succeed; and players attach the correct Bayesian posterior beliefs to each information set.

3.1 Equilibrium payoffs

We take each possible choice of Nature in turn.
(1) Suppose both parties receive signals that, in isolation, would make them relatively confident: x_1^P and x_0^D for P and D respectively yielding priors on $Pr(s = 1)$ of ρ and $1-\rho$ respectively. This occurs with *ex ante* probability $\rho(1-\rho)$. In equilibrium both then choose honest experts but, on seeing the other's choice and so knowing that the other is relatively confident too, each updates their beliefs to the posterior $Pr(s = 1) = \frac{1}{2}$. Consequently, neither party will appeal a loss in court.

In this context each player believes that the probability that their own – or their rival's – H will be the *only* one to flip in court, in which case they will lose/win the case directly, is $\frac{1}{4}$ and the probability that neither or both H experts will flip is $\frac{1}{2}$, in which case the (uninformed) court will find in their favour with probability $\frac{1}{2}$. Adding across these outcomes, we get, for $i = P, D$:

$$E\pi_1^i = \frac{1}{2}\left(\pi_{CW}^i + \pi_{CL}^i\right) \tag{1}$$

(2) Suppose, instead, both parties receive signals that, in isolation, would make them relatively unconfident of winning: x_0^P and x_1^D for P and D respectively yielding priors on $Pr(s = 1)$ of $1-\rho$ and ρ respectively. This outcome also occurs with *ex ante* probability $\rho(1-\rho)$. In equilibrium both then choose hired gun experts but, on seeing the other's choice and so knowing that the other is relatively unconfident too, each updates their beliefs to the posterior $Pr(s = 1) = \frac{1}{2}$. Consequently, again, neither party will appeal a loss in court.

In this context each player believes that the probability that their own – or their rival's – G will be the *only* one to be exposed in court, in which case they will lose/win the case directly, is $\tau(1-\tau)$ and the probability that neither or both G experts will be exposed is $[\tau^2 + (1-\tau)^2]$, in which case the (uninformed) court will find in their favour with probability $\frac{1}{2}$. Adding across these outcomes, we once more get, for $i = P, D$:

$$E\pi_2^i = \frac{1}{2}\left(\pi_{CW}^i + \pi_{CL}^i\right) = E\pi_1^i \tag{2}$$

(3) A third possibility is that P and D receive the same signal x_1 that indicates $s = 1$ is likely; this is good for P but not for D and the equilibrium calls for H^P and G^D experts. This outcome occurs with *ex ante* probability $\frac{1}{2}\{\rho^2 + (1-\rho)^2\}$. Seeing G^D (H^P), P (D) updates their prior on $s = 1$ to ρ_1 and, consequently, it is in P's interests to appeal a loss in court but not in D's. All up, then, there is a $(1-\tau)(1-\rho_1)$ that only H^P will flip in court, yielding the win to D, and a $\tau\rho_1$ chance that only G^D will be exposed and P will win outright. Failing these (with overall probability $\tau + \rho_1 - 2\tau\rho_1$) the court decides and, being uninformed, yields a win to P or D each with probability $\frac{1}{2}$. In the latter case, however, P would appeal and would win, for π^P_{AW}, so D will offer $S(D) = \pi^P_{AW}$ to settle and preempt the appeal and the offer would be accepted. All up,

$$E\pi^P_3 = (1-\tau)(1-\rho_1)\pi^P_{CL} + \tau\rho_1\pi^P_{CW} + \frac{1}{2}(\tau + \rho_1 - 2\tau\rho_1)\left[\pi^P_{CW} + \pi^P_{AW}\right] \tag{3}$$

$$E\pi^D_3 = (1-\tau)(1-\rho_1)\pi^D_{CW} + \tau\rho_1\pi^D_{CL} + \frac{1}{2}(\tau + \rho_1 - 2\tau\rho_1)\left[\pi^D_{CL} - \pi^P_{AW}\right] \tag{3a}$$

(4) The final possibility is that P and D receive the same signal x_0 that indicates $s = 1$ is unlikely; this is bad for P but good for D and the equilibrium calls for G^P and H^D experts. This outcome also occurs with *ex ante* probability $\frac{1}{2}\{\rho^2 + (1-\rho)^2\}$. The reasoning here is exactly the same as in case (3) above but with the parties' roles reversed, and overall we now get:

$$E\pi^P_4 = (1-\tau)(1-\rho_1)\pi^P_{CW} + \tau\rho_1\pi^P_{CL} + \frac{1}{2}(\tau + \rho_1 - 2\tau\rho_1)\left[\pi^P_{CL} - \pi^D_{AW}\right] \tag{4}$$

$$E\pi^D_4 = (1-\tau)(1-\rho_1)\pi^D_{CL} + \tau\rho_1\pi^D_{CW} + \frac{1}{2}(\tau + \rho_1 - 2\tau\rho_1)\left[\pi^D_{CW} + \pi^D_{AW}\right] \tag{4a}$$

All in all, expected payoffs in the conjectured equilibrium are just the probability-weighted sums of the payoffs just described in each of these four possible outcomes. Using asterisks to denote equilibrium values, we have, for $i = P, D$:

$$E\pi^{i*} = \rho(1-\rho)\left[E\pi^i_1 + E\pi^i_2\right] + \frac{1}{2}\{\rho^2 + (1-\rho)^2\}\left[E\pi^i_3 + E\pi^i_4\right] \tag{5}$$

3.2 Deviations

To confirm the conjectured equilibrium as a PBE we need to ensure that it is robust to deviations by the players. As payoffs are additive across the four outcomes described above, so for each player we need to consider only two particular deviations in isolation, while the rival continues to play the equilibrium strategy (of $x_1^P \longrightarrow H^P, x_0^P \longrightarrow G^P, x_1^D \longrightarrow G^D, x_0^D \longrightarrow H^D$): if neither is attractive then nor is the combination of the two. The deviations we need to consider are:

$$I^P : x_0^P \longrightarrow H^P; II^P : x_1^P \longrightarrow G^P; I^D : x_1^D \longrightarrow H^D; II^D : x_0^D \longrightarrow G^D$$

We consider each of these in turn, discussing only the intuition of the cases here and relegating the algebra to the Appendix.

3.2.1 Deviation I^P: P pretends to be confident

We start with the case where P receives a discouraging signal – x_0^P – but nevertheless retains an honest expert. This applies to cases (2) and (4) above when D, playing the equilibrium strategy, chooses G^D and H^D respectively. *Given* x_0^P, the conditional probability of case (2) is $2\rho(1-\rho)$ (while that of case (4) is greater at $\{\rho^2 + (1-\rho)^2\}$.)

Consider the less-likely case (2). Here we have signals x_0^P and x_1^D and in equilibrium a party initially believes their chances of winning are very low and so chooses a hired gun expert but, on seeing the rival's choice, updates to a posterior chance of winning of a half, still too low to warrant appealing a loss. In this deviation, however, while P understands that their true probability of winning is still a half, D sees H^P and so concludes that the chances of P winning are even higher, at ρ_1. So in the deviation there would still be no appeals by either party. From P's perspective, the only consequence of this deviation, then, is that the chance that they lose outright changes from τ to $\frac{1}{2}$ as they switch from a hired gun to an honest expert. If τ is relatively low (less than $\frac{1}{2}$) then this is unambiguously bad for P and so is unattractive.

The second and more likely outcome when P receives a discouraging signal is case (4), wherein D gets an encouraging signal x_0^D and chooses H^D. In equilibrium both parties recognize that $Pr(s = 1) = (1 - \rho_1)$ so P would not appeal a loss in court whereas D would. This is still the case for P, but P's deviation to retain an H^P rather than a G^P persuades D that $Pr(s = 1) = \frac{1}{2}$ and so deters any appeal they might make. From P's perspective, then, there is a potential trade-off in pursuing this deviation: it discourages D from wishing to launch an appeal that D would win, which is good for P, but it also changes the probability of outright loss in court from τ (their G^P being exposed) to ρ_1

(their H^P flipping positions.) If τ is low then this is undesirable for P. The benefit to P of this deviation occurs only when D loses in court and the deviation prevents the appeal-forestalling settlement that would occur in equilibrium.

So the only case in which this deviation might be attractive to P is in the state of the world where D is confident, when the deviation can discourage an otherwise successful appeal by D. While this case is relatively likely (compared to D getting a discouraging signal) in this setting where P is not confident, and the relative likelihood of it is increasing in ρ, the reliability of the parties' prior beliefs, nevertheless it is the case that the deviation of P choosing an honest expert when they are not confident will be unattractive if ρ (and thus ρ_1) is relatively high and appeals are sufficiently costly. This is demonstrated formally in Appendix A.1.1.

3.2.2 Deviation II^P: P pretends to be unconfident

We next discuss the case where P receives an encouraging signal – x_1^P – but nevertheless retains a hired gun expert. This applies to case (1) (with conditional probability $2\rho(1-\rho)$) and to the more likely case (3) (with conditional probability $\{\rho^2 + (1-\rho)^2\}$) wherein D, playing the equilibrium strategy, chooses H^D and G^D respectively.

Consider case (1). Here we have signals x_1^P and x_0^D and in equilibrium each party initially believes their chances of winning are very good and chooses an honest expert but, on seeing the rival's choice, updates to a posterior chance of winning of only $\frac{1}{2}$ and so does not appeal a loss in court. In this deviation, however, while P understands that their true probability of winning is still $\frac{1}{2}$, D sees G^P and concludes that their own chances of winning are even higher, at ρ_1. So in the deviation D would appeal a loss in court whilst P would not. For P this deviation offers a gain in reducing the chance of immediate outright loss from $\frac{1}{2}$ to $\frac{1}{2}\tau$. But the deviation will also reduce the chance of an immediate outright win for P and will induce D to appeal a loss that they would otherwise not pursue. Whilst P will win that appeal, as the true probability of each state is $\frac{1}{2}$ and so the appeal court will not overturn the initial finding, their profits fall from π_{CW}^P to π_{AW}^P, a loss of $(1-\lambda)f_A$. All up we can show that this deviation in this case is unprofitable for P.

Turning finally to case (3), here D gets a discouraging signal x_1^D and chooses G^D. In equilibrium both parties recognize that $Pr(s=1) = \rho_1$ so P would (successfully) appeal a loss in court whereas D would not. This is still the case for P, and also for D, the deviation by P to retain a G^P convincing D that $Pr(s=1) = \frac{1}{2}$, which is still sufficient to deter any appeal they might make. From P's perspective, then, the only possible attraction of the deviation comes from changing the probabilities of the various outcomes. Appendix A.1.2 demonstrates that this deviation of P choosing a hired gun expert when they are confident will be unattractive if ρ (and thus ρ_1) is relatively high and close to 1 and τ is not too low.

3.2.3 Deviations I^D and II^D: D conceals its signal

The analysis of these deviations is exactly the same as in the previous two subsections but with the parties' roles reversed. Accordingly, the conditions for them to be unprofitable are just as in the discussions above, *mutatis mutandis*.

3.3 An equilibrium: summary

So, when ρ is sufficiently high – that is, the parties' signals are sufficiently accurate – there exists a separating PBE in which a confident party signals its confidence to its rival through the retention of an honest expert and otherwise retains a hired gun expert. A good intuition for this comes from considering the limiting case in which ρ actually equals one and so information is perfect. Then cases 1 and 2 disappear and an honest expert will never flip for the confident party but will always flip for the unconfident one. A hired gun might be exposed, so an honest expert is a strictly dominant choice for the confident party while a hired gun is at least as good as an honest expert for their unconfident rival.[22]

4 Other equilibria

Potentially there could be a separating equilibrium here in which low-confidence parties signal this through the retention of an honest expert, but Appendix A.2.1 demonstrates

[22] Selecting an honest expert guarantees an immediate loss in court for an unconfident player i and so a payoff of π^i_{CL}. But choosing a hired gun means an immediate τ chance of this same payoff, and another $\frac{1}{2}(1-\tau)$ of the same payoff (when the court decides against them) but a $\frac{1}{2}(1-\tau)$ chance, too, that the case is decided in their favor. In that case it will be appealed by the rival and the player will settle that appeal, knowing it would succeed. The settlement involves a payment of π^j_{AW} and, so long as $\lambda \neq 1$, the settlement can be better for the potential respondent than losing outright in court, as they can implicitly pocket any avoided appeals costs the appellant would otherwise incur. This is why an unconfident player can be better off with a hired gun rather than an honest expert even when the state is known with certainty.

that this cannot survive deviations, as it cannot discourage appeals by a confident rival but is particularly costly when the chance of the honest expert flipping positions in court is relatively high. That leaves two possible pooling equilibria, one of which is where all types choose an honest expert. Appendix A.2.2 shows that this can also be ruled out as a PBE under reasonable conditions.[23]

That leaves the possibility of a pooling equilibrium in which both parties choose a hired gun, for all signals. While such an equilibrium can be ruled out in certain situations, it is also the case that it will exist for some parameterizations. Suppose that τ is very low – say, zero – and suppose, further, that any deviation by a player to an H is believed to come from an unconfident player. Then a deviation will not discourage appeals in a rival and so becomes less attractive and Appendix A.2.2 shows that the conjectured equilibrium can survive. There is little further that can be said, analytically, however, so we provide some numerical examples in the following section to illustrate what kinds of equilibrium can arise under different constellations of parameters.

5 Some simulations

To offer some illustrations of the likelihood of the various possible equilibria discussed above, in this section we discuss some numerical simulations of the model.[24] Our base case is shown in Figure 1 in which we have the 'American' rule for cost allocation (so each party pays its own costs and $\lambda = 1$) and a player believes that any deviation from a potential pooling equilibrium is most likely to have come from an unconfident rival.[25]

[23]Deviation by an unconfident party to retain a hired gun will be profitable if the other party attaches a sufficiently high probability to an off-equilibrium deviation coming from a confident rival (and thus not appealing a court loss in such a case), or if ρ is high and a losing party's loss from defeat is sufficiently similar to the other's gain from victory ($W^i \cong L^j$); and if ρ is very low then a *confident* party might wish to deviate and retain a hired gun.

[24]The simulations reported here were run in – and the plots generated by – GAUSS 19.2 with the following "base case" values for parameters: $f_A = 600$, $f_C = 200$,$W = 850$ and $L = 250$. The parameter ρ ranges from $\frac{1}{2}$ to 0.95 and τ from 0 to $\frac{1}{4}$.

[25]The simulations set the belief that a deviation comes from a confident rival, denoted s^*, to either zero or one but this is without any loss of generality. The key condition is that this belief is less than or greater than a threshold value – approximately 45% in the case of Figure 1. Roughly, if s^* is low then a player believes a deviation is most likely to have come from an unconfident rival and so they are less likely to respond to it, in terms of their subsequent behavior if called upon to decide on an appeal, in a way that benefits the deviator. Hence we describe these as "optimistic beliefs", and they make a pooling equilibrium more likely, in a sense.

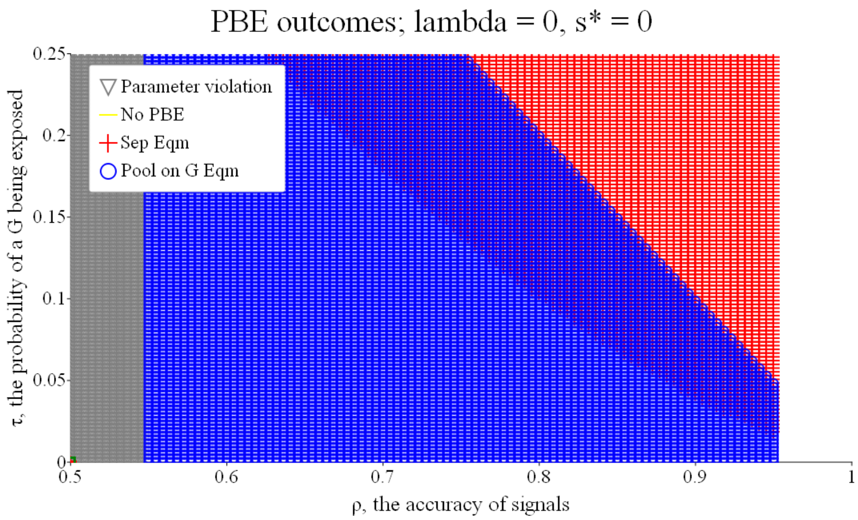

Figure 1: Equilibrium outcomes, 'American' rule, "optimistic" beliefs

The Figure illustrates a case in which some PBE generally exists and in which it is either the separating equilibrium established above or a pooling equilibrium in which both players retain a hired gun regardless of their signal. Note that an increase in τ, the probability of a hired gun being exposed in court, makes the separating equilibrium (weakly) more likely, as does an increase in ρ, the accuracy of the parties' signals. These phenomena are consistent with the intuition for these equilibria, discussed earlier. Note, too, that there is a significant region in which multiple equilibria can prevail.

Suppose that we consider the same case but instead adopt an extreme 'English' rule for costs allocation: all are borne by the loser. Figure 2 shows this case.

Figure 2 demonstrates a couple of differences with the base case. First, the set of parameter values that can sustain the separating equilibrium is a lot smaller here than under the 'American' rule. This is because deviation by an unconfident party to an honest expert becomes more attractive as deterring its rival from appealing becomes more profitable[26] Second, and a corollary of the first point, there is now a range of parameter values – high τ and ρ – for which no PBE exists.

A final exercise of some interest is to compare the base case shown in Figure 1 to a case less amenable to a pooling equilibrium in which a party attaches a high probability

[26] Appendix A.1.1 shows that the separating equilibrium cannot exist under the 'English' rule when $\rho = 1$.

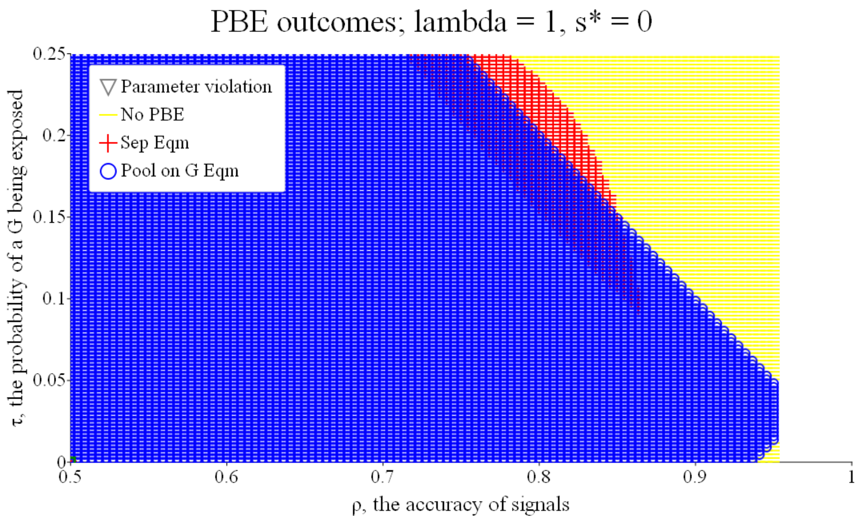

Figure 2: Equilibrium outcomes, 'English' rule, "optimistic" beliefs

to any deviation from equilibrium play coming from a confident rival. This is shown in Figure 3.

As anticipated, this makes the pooling equilibrium less likely and, with these parameters, removes any possibility of multiple equilibria, whilst introducing the possibility that no PBE might exist at all. Nevertheless, the general tenor of the results – that the separating PBE is weakly more likely the higher is ρ and/or τ – still obtains here.[27]

6 Welfare and implications

Assessing the welfare consequences of equilibria here requires some determination as to the goals of the legal trial system. One might think it should maximize the expected payoffs of the parties in each instance, but that seems too much to ask: in practice, court systems are not concerned with the payoffs of the parties but with getting the "right" outcome

[27] There is no general analytical result, independent of ρ and τ, concerning whether a deviation from a conjectured pooling equilibrium is more attractive to a confident or an unconfident party. Comparison of Figures 1 and 3 suggests, however, that for values of ρ and τ for which the pooling equilibrium survives in Figure 3, the pooling equilibrium will be robust to refinements concerning beliefs about the identity of a deviator, as it survives for all possible such beliefs.

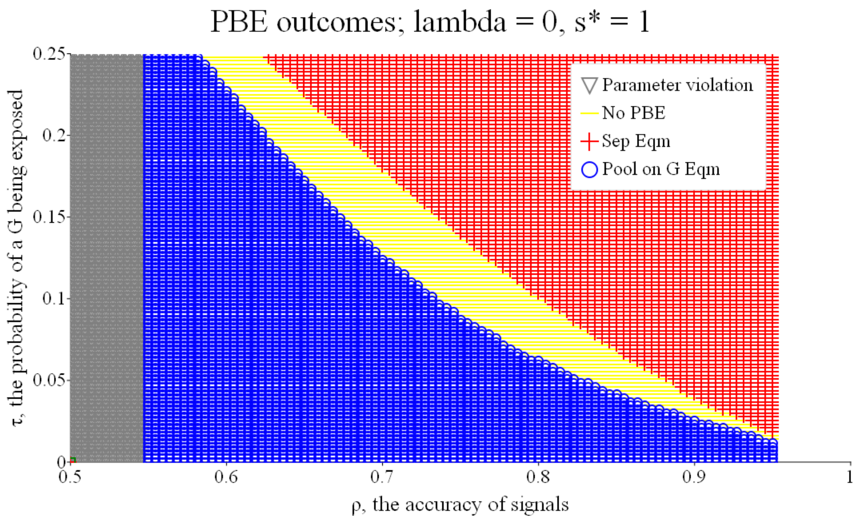

Figure 3: Equilibrium outcomes, 'American' rule, "pessimistic" beliefs

at minimal cost.[28] In the present setting, as honest experts and hired guns are equally costly, so the separating equilibrium would be socially preferable to the pooling outcome, *ceteris paribus*: the parties' information is better (the consequence of both signals, not just one) and appeals are initiated – and settled – only when they are most likely to lead to the correct outcome.

Furthermore, the separating PBE, when it exists, would be preferable to a situation in which both parties could be *required*, somehow, to use only honest experts. Pooling on H muddies the signals, compared to the separating case, and leads to too many appeals. In particular, as a party will appeal in such a setting whenever they get an encouraging signal, so there will be appeals when both parties get such signals, even though the best assessment of the probability of each state in such a case is only $\frac{1}{2}$. The appeal court adds nothing but costs in this case. Consequently, one can think of the separating PBE here as an efficient mechanism for the dissemination of information amongst the litigant parties

[28] This is subject to the remarks in footnote 16, of course. One might also argue that the goal of maximizing expected payoffs is a meta-objective of the legal system as a whole and so informs the design of that system in the first place. For example, Spier's 2007 Handbook chapter on litigation adopts the premise that, "the main purpose of the court system is to facilitate value-creating activities and deter value-destroying activities through the enforcement of contracts and laws", while acknowledging the existence of other purposes, such as information dissemination, adjusting and refining laws through *stare decisis* and so on [22, Spier, 2007 p.262].

and the courts.

In this model, increasing the likelihood of exposure of a hired gun (τ) or the accuracy of the parties' priors (ρ) will be welfare improving, but these are conclusions that will hold far more widely, of course. Furthermore, we do not address the question of whether or not the plaintiff litigates in the first place, but allowing for this will complicate any conclusions about the desirability of greater signal accuracy to discipline the choice of experts. Our analysis does suggest that one can be too sanguine about the disciplinary power of the market for expert witnesses, through reputation and career concerns, to curtail incentives for mercenary behavior; indeed, our results suggest that the market for hired guns might be quite active. Our simulation results also reveal a hidden feature of rules governing the allocation of costs: when costs are primarily borne by the loser of a case (the 'English' rule), the socially desirable separating equilibrium becomes much harder to sustain. The reason is that the temptation to try and prevent one's rival from appealing a loss in Court is then much higher, as the costs of losing on appeal are that much higher, and so deviation by an unconfident party from the separating equilibrium is profitable over a larger range of parameters.

Posner [18] makes a number of recommendations regarding reforms to the way in which expert witnesses are employed in courts. One is that courts themselves appoint experts; in our setting that might seem to be ineffective due to our information structure in which courts are not informed as to the types of the experts, but how a hired gun would behave under such an appointment is not clear![29] Another is that, "lawyers who call an economic expert as a witness should be required to disclose the name of all economists whom they contacted as possible witnesses. This will alert the jury to the problem of 'witness shopping'."[18, Posner, 1999 p.98]. Our analysis suggests, however, that such a

[29] Rubinfeld [20], suggests that one possible solution to the problem of a court's inability to pick a neutral expert might be, "for both parties to propose a set of possible experts and in consultation to reach an agreement about an acceptable choice." This choice would then be appointed – and, presumably, remunerated – by the court. Article 252 of the Treaty on the Functioning of the European Union (TFEU, `https://eur-lex.europa.eu/eli/treaty/tfeu_2012/oj`) provides that the European Court of Justice, "shall be assisted by eight Advocates-General. Should the Court of Justice so request, the Council, acting unanimously, may increase the number of Advocates-General. It shall be the duty of the Advocate-General, acting with complete impartiality and independence, to make, in open court, reasoned submissions on cases which, in accordance with the Statute of the Court of Justice of the European Union, require his [*sic*] involvement." New Zealand, in using a system of lay members of its High Court (`https://www.courtsofnz.govt.nz/the-courts/high-court/cases-to-court/#lay-members`), also makes some effort to bring neutral experts to bear.

policy could be harmful: if juries take a lengthy list to imply less reliability of a litigant's case then, in a world where ideologue expert witnesses are available, such a policy could discourage law firms from approaching honest experts where they might otherwise do so.

7 Summary and conclusion

This paper addresses the question of an informed law firm selecting an expert witness to testify before an uninformed court. The court prefers to hear from an honest witness but the only way in which such a witness can credibly reveal their type is through testimony that is at odds with their retainer's position and this, of course, is undesirable for the latter. In answer to our titular question, we show that choosing an honest expert over a hired gun or ideologue may be a credible means for a law firm to signal its confidence to its rival.

We present this argument in a setting in which the court of first instance is subject to appeal to a higher court. What drives the separating equilibrium is the usual configuration of features in this sort of Bayesian game: that there are different types of agents (differentiated here by confidence) and the 'better' of them has a signal (retaining an honest expert) available to indicate its type. The signal is costly – here the choice of an honest expert runs the risk of their changing their mind in court and losing the case irretrievably – and is more costly for a type that might choose to mimic a 'better' type: the probability of 'flipping' here is decreasing in a party's confidence. In this light, the general result seems robust to many of the particular assumptions made in the analysis: the intention to appeal being the consequence of confidence; the fact that the appeal court has access to the full information of both parties; and the true probability of each side of the dispute being correct being 50% – these can all be relaxed. The 50-50 priors could be generalized at the cost of more algebra and one could also conduct a similar analysis wherein there is no appeal stage but, instead, the parties put (private) effort into the litigation and the likelihood of the court's decision favoring a litigant is affected positively by such effort. Such an extension also indicates that our assumption that the experts' opinions are fully determinative of the outcome of the case is also not essential, so long as they are important. Note, too, that the important property of the appeal court here is just that it is *better* informed than the initial court, not that it is as well informed as we model it here; this, too, could be relaxed.

The analysis here has focussed on the 'demand' side of the expert witness market and a useful line of future enquiry would be to look at the 'supply' side. We have assumed that the cost to a legal firm of an H or a G is the same and part of the rationale is that, particularly under the 'English' rule in which costs are revealed in court, a G charging more or less than an H would be revealing of their type to the Court and so completely undermining. Absent this consideration, however, if the career costs of exposure as a G are very high then one might anticipate that a G would be more expensive to retain and it would be interesting to see what consequences flow from free entry into the expert witnesses market wherein entrants pre-commit to a 'type'.

References

[1] Alonso, R. and O. Câmara, 2018. On the value of persuasion by experts. *Journal of Economic Theory* 174, 103-123.

[2] Australian Competition Tribunal. *Re Qantas Airways Limited* [2004] ACompT 9 (12 October 2004).

[3] Bar-Isaac, H. and J. Deb, 2014. What is a Good Reputation? Career Concerns with Heterogeneous Audiences. *International Journal of Industrial Organization* 34#1, 44-50.

[4] Che, Y-K. and S. Severinov, 2017. Disclosure and legal advice. *American Economic Journal: Microeconomics* 9#2, 188-225.

[5] *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

[6] Daughety, A. and J. Reinganum, 2000. Appealing judgments. *The RAND Journal of Economics* 31 #3, 502-25.

[7] Dewatripont, M. and J. Tirole, 1999. Advocates. *Journal of Political Economy* 107#1, 1-39.

[8] Dworczak, P. and A. Pavan, 2020. Preparing for the worst but hoping for the best: robust (Bayesian) persuasion. Mimeo. Available at SSRN: `https://ssrn.com/abstract=3523114`. Accessed November 2020.

[9] Federal Court of Australia, 2016. Harmonised Expert Witness Code of Conduct. Annexure A to Expert Evidence Practice Note (GPN-EXPT). Available at `https://www.fedcourt.gov.au/law-and-practice/practice-documents/practice-notes/gpn-expt#AnnexureA`. Accessed June 2019.

[10] Gentzkow, M. and E. Kamenica, 2017. Competition in persuasion. *Review of Economic Studies* 84, 300-322.

[11] Government of Canada, 2015. Code of Conduct for Expert Witnesses. Available at `https://laws-lois.justice.gc.ca/eng/regulations/SOR-98-106/page-127.html`. Accessed June 2019.

[12] Hand, B.L., 1901. Historical and practical considerations regarding expert testimony. *Harvard Law Review* 15#1, 40-58.

[13] Kamenica, E. and M. Gentzkow, 2011. Bayesian persuasion. *American Economic Review* 101#6, 2590-2615.

[14] Kaplow, L., 2013. Multistage adjudication. *Harvard Law Review* 126#5, 1179-1298.

[15] Kartik, N., F. Lee and W. Suen, 2017. Investment in concealable information by biased experts. *RAND Journal of Economics* 48#1, 24-43.

[16] Krishna, V. and J. Morgan, 2001. A model of expertise. *The Quarterly Journal of Economics* 116#2, 747-775.

[17] Parliamentary Counsel Office of New Zealand, 2016. Code of conduct for expert witnesses. Schedule 4 to High Court Rules. Available at `http://www.legislation.govt.nz/regulation/public/2016/0225/latest/DLM6953324.html`. Accessed June 2019.

[18] Posner, R., 1999. The law and economics of the economic expert witness. *Journal of Economic Perspectives* 13#2, 91-99.

[19] Restrictive Practices Court (in England and Wales). *Re Televising Premier League football matches* [2000] EMLR 78-243.

[20] Rubinfeld, D., 1985. Econometrics in the courtroom. *Columbia Law Review* 85 #5, 1048-97.

[21] Shavell, S., 1995. The appeals process as a means of error correction. *Journal of Legal Studies* 24 #2, 378-426.

[22] Spier, K., 2007. *Litigation*. Chapter 4 of M. Polinsky and S. Shavell, eds, 2007. The Handbook of Law and Economics Vol. 1. North-Holland: Amsterdam.

[23] Veljanovski, C., 2009. Economists in court: a comparative assessment of procedures and experience in Australia and England & Wales from an economist's perspective. Mimeo. Available at SSRN: `https://ssrn.com/abstract=1519952` or `http://dx.doi.org/10.2139/ssrn.1519952`. Accessed July 2019.

Appendix

A.1 The algebra of deviations

A.1.1 Deviation I^P: P pretends to be confident

We start with the case where P receives a discouraging signal – x_0^P – but nevertheless retains an honest expert. This applies to cases (2) and (4) above when D, playing the equilibrium strategy, chooses G^D and H^D respectively. Consider case (2). Under this deviation, while P understands that their true probability of winning is still $\frac{1}{2}$, D sees H^P and concludes that the chances of P winning are even higher, at ρ_1. So in the deviation there would, as in the conjectured equilibrium, still be no appeals by either party in this case.

From P's perspective, there is a $\frac{1}{2}(1-\tau)$ chance that their H^P will flip in court but G^D will not be revealed, losing P the case outright. There is a $\frac{1}{2}\tau$ chance that only G^D will be exposed, so P wins, and so a $\frac{1}{2}$ chance that the court makes a 50-50 decision favoring P or D. All up,

$$E\pi^P_{I_2^P} = \frac{1}{2}(1-\tau)\pi^P_{CL} + \frac{1}{2}\tau\pi^P_{CW} + \frac{1}{4}\pi^P_{CW} + \frac{1}{4}\pi^P_{CL} = \frac{1}{4}\left((3-2\tau)\pi^P_{CL} + (1+2\tau)\pi^P_{CW}\right)$$

This compares to the payoff from following the equilibrium strategy of $E\pi_2^P$ from equation (2) so the loss from the deviation (i.e. the gain from sticking to the equilibrium strategy) is:

$$\Delta^P_{I_2} \equiv E\pi^P_2 - E\pi^P_{I_2^P} = \frac{1}{2}\left(\frac{1}{2}-\tau\right)\left(\pi^P_{CW} - \pi^P_{CL}\right) > 0 \tag{A.1}$$

Note that this bears out the intuition exposited in the paper. The only effect on P of this deviation in this case is to raise their chance of immediate loss from τ to $\frac{1}{2}$: if $\tau = \frac{1}{2}$ then this expression is zero.

The second outcome to consider here is case (4), wherein D gets an encouraging signal x_0^D and chooses H^D. In equilibrium both parties recognize that $Pr(s=1) = (1-\rho_1)$ so P would not appeal a loss in court whereas D would. This is still the case for P, but the deviation by P convinces D that $Pr(s=1) = \frac{1}{2}$ and so deters any appeal they might make. From P's perspective, then, we have two honest experts with no appeals and a probability of winning of only $(1-\rho_1)$. So there is a very high ρ_1^2 chance that only H^P will flip and P will lose, a small $(1-\rho_1)^2$ chance that only H^D will flip and P will win, and a $2\rho_1(1-\rho_1)$ chance of neither or both flipping in which case the court gives P a 50-50 chance of winning or losing, neither outcome being appealed. Combining,

$$E\pi^P_{I_4^P} = (1-\rho_1)\pi^P_{CW} + \rho_1\pi^P_{CL}$$

This compares to the payoff from following the equilibrium strategy of $E\pi_4^P$ from equation (4) so, after some manipulations, we can write the loss from the deviation (i.e. the gain from sticking to the equilibrium strategy) as:

$$\Delta_{I_4}^P \equiv E\pi_4^P - E\pi_{I_4^P}^P = -\tau(1-\rho_1)\pi_{CW}^P - \frac{1}{2}(\rho_1-\tau)\pi_{CL}^P - \frac{1}{2}(\rho_1+\tau-2\tau\rho_1)\pi_{AW}^D \quad \text{(A.2)}$$

The overall cost of this deviation I^P, then, is the probability-weighted sum of these two terms (A.1) and (A.2):

$$\begin{aligned}
\Delta_{I^P}^P &= 2\rho(1-\rho)\Delta_{I_2}^P + \{\rho^2+(1-\rho)^2\}\Delta_{I_4}^P \\
&= \rho(1-\rho)\left(\frac{1}{2}-\tau\right)\left(\pi_{CW}^P-\pi_{CL}^P\right) - \{.\}\tau(1-\rho_1)\pi_{CW}^P - \frac{1}{2}\{.\}(\rho_1-\tau)\pi_{CL}^P \\
&- \frac{1}{2}\{.\}(\rho_1+\tau-2\tau\rho_1)\pi_{AW}^D \\
&= \frac{1}{2}(1-\rho)(\rho-2\tau)\pi_{CW}^P - \left(\frac{1}{2}-\tau\right)\rho\pi_{CL}^P - \frac{1}{2}\rho^2\pi_{AW}^D - \frac{1}{2}\tau(2\rho-1)\left(\pi_{CL}^P-\pi_{AW}^D\right)
\end{aligned}$$

For this deviation to be unprofitable we need $\Delta_{I^P}^P \geq 0$ but there are no simple conditions under which that is the case. Note, however, that when $\rho = 1$:

$$\begin{aligned}
\left(\Delta_{I^P}^P\right)\big|_{\rho=1} &= -\left(\frac{1}{2}-\tau\right)\pi_{CL}^P - \frac{1}{2}\pi_{AW}^D - \frac{1}{2}\tau\left(\pi_{CL}^P-\pi_{AW}^D\right) \\
&= -\frac{1}{2}(1-\tau)\pi_{CL}^P - \frac{1}{2}(1-\tau)\pi_{AW}^D \\
&= -\frac{1}{2}(1-\tau)\left(\pi_{AW}^D+\pi_{CL}^P\right) = -\frac{1}{2}(1-\tau)\left[W^D - L^P - 2f_C - (1-\lambda)f_A\right]
\end{aligned}$$

If the square-bracketed term is negative then this overall expression is positive and this will occur, *ceteris paribus*, if the cost of winning appeals, $(1-\lambda)f_A$, is sufficiently high. By contrast, under the 'English' rule, or $\lambda = 1$, this deviation must always be attractive at $\rho = 1$ so the conjectured equilibrium fails for sure in that case.

Further, the derivative of $\Delta_{I^P}^P$ with respect to ρ is:

$$\begin{aligned}
\frac{\partial}{\partial\rho}\left(\Delta_{I^P}^P\right) &= \frac{1}{2}\left(1-2\rho+2\tau\right)\pi_{CW}^P - \left(\frac{1}{2}-\tau\right)\pi_{CL}^P - \rho\pi_{AW}^D - \tau\left(\pi_{CL}^P-\pi_{AW}^D\right) \\
&= \left(\frac{1}{2}-\rho+\tau\right)\pi_{CW}^P - \frac{1}{2}\pi_{CL}^P - (\rho-\tau)\pi_{AW}^D
\end{aligned}$$

Hence,

$$\left(\frac{\partial}{\partial\rho}\left(\Delta_{I^P}^P\right)\right)\bigg|_{\rho=1} = -\frac{1}{2}\left(\pi_{CW}^P+\pi_{CL}^P\right) + \tau\pi_{CW}^P - (1-\tau)\pi_{AW}^D$$

The first bracketed term on the right hand side of this expression is positive, under our maintained assumptions, so the overall expression is negative for sufficiently low values of τ. Combined with the previous result, and given that these payoffs are all continuous in ρ, this suggests there is a range of high values of ρ for which $\Delta^P_{IP} \geq 0$ and so the deviation is unprofitable, if τ is sufficiently small.[30]

A.1.2 Deviation II^P: P pretends to be unconfident

We next address the case where P receives an encouraging signal – x_1^P – but nevertheless retains a hired gun expert. This applies to cases (1) and (3) above when D, playing the equilibrium strategy, chooses H^D and G^D respectively. Consider case (1). *Given* x_1^P, the conditional probability of case (1) is $2\rho(1-\rho)$. Here we have signals x_1^P and x_0^D and in equilibrium each party initially believes their chances of winning are very good and chooses an honest expert but, on seeing the rival's choice, updates to a posterior chance of winning of only $\frac{1}{2}$ and so does not appeal a loss in court. In this deviation, however, while P understands that their true probability of winning is still $\frac{1}{2}$, D sees G^P and concludes that the chances of winning are even higher, at ρ_1. So in the deviation D would appeal a loss in court whilst P would not, but P would not settle the case to prevent D's appeal.

From P's perspective, there is a $\frac{1}{2}(1-\tau)$ chance that H^D alone will flip in court, winning P the case outright. There is a $\frac{1}{2}\tau$ chance that G^P alone will be exposed, so P loses, and a $\frac{1}{2}$ chance that the court makes a 50-50 decision favoring P or D. In the latter case if P wins then D will appeal and P knows that appeal will fail. All up,

$$E\pi^P_{II^P_1} = \frac{1}{2}(1-\tau)\pi^P_{CW} + \frac{1}{2}\tau\pi^P_{CL} + \frac{1}{4}\pi^P_{CL} + \frac{1}{4}\pi^P_{AW}$$

This compares to the payoff from following the equilibrium strategy of $E\pi_1^P$ from equation (1) so the loss from the deviation (i.e. the gain from sticking to the equilibrium strategy) is:

$$\Delta^P_{II_1} \equiv E\pi_1^P - E\pi^P_{II^P_1} = \frac{1}{2}\tau\left(\pi^P_{CW} - \pi^P_{CL}\right) - \frac{1}{4}\left(\pi^P_{AW} - \pi^P_{CL}\right) \tag{A.3}$$

While both bracketed terms here are positive, the second (the gain from a win on appeal versus a loss in court) is smaller than the first (the gain from a win in court versus a loss in court). But the first is weighted by τ, so the overall expression is negative at low τ and positive as τ tends to $\frac{1}{2}$.

The second outcome to consider here – which occurs with conditional probability $\{\rho^2 + (1-\rho)^2\}$ – is case (3), wherein D gets a discouraging signal x_1^D and chooses G^D. In equilibrium both parties recognize that $Pr(s=1) = (\rho_1)$ so P would (successfully) lodge an appeal from a loss in court, causing D to settle the case (whereas D would not appeal

[30] To be precise, if $\tau < \frac{\pi^D_{AW}}{(\pi^P_{CW}+\pi^D_{AW})} = \frac{W^D-(1-\lambda)(f_C+f_A)}{(W^P-(1-\lambda)f_C+W^D-(1-\lambda)(f_C+f_A))}$.

a loss.) This is still the case for P, and also for D: the deviation by P to retain a G^P convinces D that $Pr(s=1)=\frac{1}{2}$, still deterring any appeal they might make. From P's perspective, then, we have two hired gun experts but P will still appeal a loss in court, D will not settle and P knows they will carry the appeal. So there is a $\tau(1-\tau)$ chance of only G^P being exposed and P losing outright and of only G^D being exposed and P winning outright, and a $\{\tau^2+(1-\tau)^2\}$ chance of neither or both being exposed, in which case the court gives P a 50-50 chance of winning or losing. In the latter case they will appeal and win on appeal. Combining,

$$\begin{aligned} E\pi^P_{II^P_3} &= \tau(1-\tau)\pi^P_{CL}+\tau(1-\tau)\pi^P_{CW}+\frac{1}{2}\{\tau^2+(1-\tau)^2\}\left(\pi^P_{CW}+\pi^P_{AW}\right) \\ &= \tau(1-\tau)\pi^P_{CL}+\frac{1}{2}\pi^P_{CW}+\frac{1}{2}\{\tau^2+(1-\tau)^2\}\pi^P_{AW} \end{aligned}$$

This compares to the payoff from following the equilibrium strategy of $E\pi^P_3$ from equation (3) so, after some manipulations, we can write the loss from the deviation (i.e. the gain from sticking to the equilibrium strategy) as:

$$\begin{aligned} \Delta^P_{II_3} \equiv E\pi^P_3 - E\pi^P_{II^P_3} &= (1-\tau)\left(1-\rho_1-\tau\right)\pi^P_{CL}-\frac{1}{2}\left(1-\rho_1-\tau\right)\pi^P_{CW} \\ &+ \frac{1}{2}\left(\rho_1+\tau-2\tau\rho_1-\tau^2-(1-\tau)^2\right)\pi^P_{AW} \\ &= (1-\rho_1-\tau)\left[(1-\tau)\pi^P_{CL}-\frac{1}{2}\pi^P_{CW}\right] \\ &+ \frac{1}{2}(1-\tau)\left(\tau-(1-\tau)(1-\rho_1)\right)\pi^P_{AW} \end{aligned}$$

That is,

$$\Delta^P_{II_3} = (1-\rho_1-\tau)\left[(1-\tau)\pi^P_{CL}-\frac{1}{2}\pi^P_{CW}-\frac{1}{2}(1-\tau)\pi^P_{AW}\right]+\frac{1}{2}\tau(1-\tau)\left(1-\rho_1\right)\pi^P_{AW} \tag{A.4}$$

Note that this expression is also negative at $\tau=0$ so the weighted average of (A.3) and (A.4) at $\tau=0$ is negative and the deviation must be profitable; the conjectured equilibrium fails if τ is too low.

More generally, the overall cost of this deviation II^P is the probability-weighted sum of these two terms (A.3) and (A.4):

$$\begin{aligned} \Delta^P_{II^P} &= 2\rho(1-\rho)\Delta^P_{II_1}+\{\rho^2+(1-\rho)^2\}\Delta^P_{II_3} \\ &= \left[\tau\rho(1-\rho)-\frac{1}{2}\{.\}\left(1-\rho_1-\tau\right)\right]\pi^P_{CW} \\ &+ \left[\frac{1}{2}\rho(1-\rho)(1-2\tau)+\{.\}\left(1-\rho_1-\tau\right)(1-\tau)\right]\pi^P_{CL} \end{aligned}$$

$$
\begin{aligned}
&- \frac{1}{2}\left[\rho(1-\rho)+(1-\tau)\left(1-\rho_1-\tau\right)\{.\}-\tau(1-\tau)\left(1-\rho_1\right)\{.\}\right]\pi^P_{AW}\\
&= \frac{1}{2}\left[\rho(2-\rho)-(1-\tau)\right]\pi^P_{CW}\\
&- \left[2\tau\rho^2(1-\tau)-(1-2\tau)-\tau^2(1-2\rho)-3\tau\rho+\frac{1}{2}\rho(3-\rho)\right]\pi^P_{CL}\\
&- \frac{1}{2}\left[(1-\rho)-\tau\rho^2(4-3\tau)-(1-2\rho)\tau(3-2\tau)\right]\pi^P_{AW}
\end{aligned}
$$

where we have used the definition of ρ_1 and the resulting fact that $(1-\rho_1)\{\rho^2+(1-\rho)^2\} = (1-\rho)^2$.

For this deviation to be unprofitable we need $\Delta^P_{II^P} \geq 0$ but, again, there are no simple conditions under which that is the case. But we can show the following:

$$
\Delta^P_{II^P}\Big|_{\rho=1} = \frac{1}{2}\tau\pi^P_{CW} - \tau(1-\tau)\pi^P_{CL} + \frac{1}{2}\tau(1-\tau)\pi^P_{AW} \geq 0
$$

That is, if ρ is sufficiently high then the deviation must be unprofitable.

In words, the potential downside of this deviation is two-fold: first, it can induce D to appeal, where it otherwise would not, inducing extra cost sharing for P (if $\lambda \neq 0$) and, second, it can increase the chance of outright loss, depending on the comparison between τ and ρ_1. The upside is the flip side of the latter effect: if τ is extremely low then choosing a G^P might be more attractive than an H^P simply for the reduction in the risk of outright loss that it might entail. Indeed, it is straightforward to show that for $\tau = 0$ we get $\Delta^P_{II^P} < 0$ (for $\rho < 1$) so the deviation is profitable and the conjectured equilibrium fails:

$$
\begin{aligned}
\Delta^P_{II^P}\Big|_{\tau=0} &= -\frac{1}{2}(1-\rho)^2\pi^P_{CW} + \left(1-\frac{1}{2}\rho(3-\rho)\right)\pi^P_{CL} - \frac{1}{2}(1-\rho)\pi^P_{AW}\\
&= \frac{1}{2}\left[-(1-\rho)^2\pi^P_{CW} - (1-\rho)\pi^P_{AW} + \left(2-3\rho+\rho^2\right)\pi^P_{CL}\right]
\end{aligned}
$$

For $\rho < 1$ the coefficient on π^P_{CL} is positive so the entire expression is negative, as claimed.

To summarize this case, the deviation can only be unprofitable and therefore unattractive if ρ is sufficiently high and τ sufficiently high.

A.2 Other equilibria

A.2.1 A separating equilibrium?

Consider a candidate separating equilibrium in which a confident (unconfident) player selects a hired gun (honest) expert. That is, a player chooses a G expert if they get an encouraging signal (x_1^P for P and x_0^D for D) and an H otherwise; a loss in court is appealed by a player if and only if they believe their chance of winning is ρ_1; an appeal by a rival is settled if and only if the potential respondent believes the appeal will succeed; and players attach the correct Bayesian posterior beliefs to each information set.

Proceeding by the same reasoning as in our analysis of the equilibrium in the paper, we first derive equilibrium payoffs in each of the four possible initial cases illustrated in Figure **??**. We focus on P alone; everything for D is symmetric, *mutatis mutandis.*

In case 1, signals x_1^P and x_0^D lead both players to choose G experts, the perceived probability of each state is $\frac{1}{2}$ and so neither player would appeal a loss in court. Consequently there is a $\tau(1-\tau)$ chance that only one of the hired gun experts will be exposed and the rival party will win and if neither is exposed then each player has a 50-50 chance of a win or loss in the court of first instance, where the case will terminate. All up,

$$E\pi_1^P = \tau(1-\tau)\left(\pi_{CW}^P + \pi_{CL}^P\right) + \frac{1}{2}\left(\tau^2 + (1-\tau)^2\right)\left(\pi_{CW}^P + \pi_{CL}^P\right) = \frac{1}{2}\left(\pi_{CW}^P + \pi_{CL}^P\right)$$

In case 2, signals x_0^P and x_1^D lead both players to choose H experts, the perceived probability of each state is again $\frac{1}{2}$ and so, again, neither player would appeal a loss in court. Consequently there is a $\rho(1-\rho)$ chance that only one of the honest experts will flip in court and the rival party will win and if neither flips then each player has a 50-50 chance of a win or loss in court, where the case will terminate. All up,

$$E\pi_2^P = \rho(1-\rho)\left(\pi_{CW}^P + \pi_{CL}^P\right) + \frac{1}{2}\left(\rho^2 + (1-\rho)^2\right)\left(\pi_{CW}^P + \pi_{CL}^P\right) = \frac{1}{2}\left(\pi_{CW}^P + \pi_{CL}^P\right)$$

In case 3, signals x_1^P and x_1^D lead D to choose an H expert and P to choose a G. Both players perceive the probability of $s=1$ to be ρ_1 and so P would appeal a loss in court and win it, so D will settle any such potential appeal. Consequently there is a $\rho_1(1-\tau)$ chance that only H^D will flip in court and P will win outright, a $\tau(1-\rho_1)$ chance that only G^P will be exposed in court and D will win outright, and if neither of these occurs then each player has a 50-50 chance of a win or loss in court. But P will appeal any such loss and D, knowing that appeal would succeed, will settle the case for π_{AW}^P. All up,

$$E\pi_3^P = (1-\tau)\rho_1\pi_{CW}^P + \tau(1-\rho_1)\pi_{CL}^P + \frac{1}{2}\left(1-\rho_1-\tau+2\tau\rho_1\right)\left(\pi_{CW}^P + \pi_{AW}^P\right)$$

Finally, in case 4, signals x_0^P and x_0^D lead P to choose an H expert and D to choose a G. Both players perceive the probability of $s=1$ to be $(1-\rho_1)$ and so D would appeal a loss in court and win it, so P will settle any such potential appeal. Consequently there is a $\rho_1(1-\tau)$ chance that only H^P will flip in court and D will win outright, a $\tau(1-\rho_1)$ chance that only G^D will be exposed in court and P will win outright, and if neither of these occurs then each player has a 50-50 chance of a win or loss in court. But D will appeal any such loss and P, knowing that appeal would succeed, will settle the case for

π^D_{AW}. All up,

$$\begin{aligned} E\pi^P_4 &= (1-\tau)\rho_1\pi^P_{CL} + \tau(1-\rho_1)\pi^P_{CW} + \frac{1}{2}(1-\rho_1-\tau+2\tau\rho_1)\left(\pi^P_{CL}-\pi^D_{AW}\right) \\ &= \tau(1-\rho_1)\pi^P_{CW} + \frac{1}{2}(\rho_1+1-\tau)\pi^P_{CL} - \frac{1}{2}(1-\rho_1-\tau+2\tau\rho_1)\pi^D_{AW} \end{aligned}$$

Now consider the following deviation: suppose that P, on getting the signal x^P_0, were to choose a hired gun expert, G^P, rather than the honest H^P called for in equilibrium, while D follows the proposed equilibrium strategy. This signal for P occurs only in cases 2 and 4 discussed above. Consider case 2 in which D gets a discouraging signal. In equilibrium they would not appeal a loss in court, believing (correctly) that the probability of $s=1$ is $\frac{1}{2}$ and in this deviation, seeing G^P, they now infer (wrongly) that P is very confident so the probability of $s=1$ is ρ_1 and so still they will not appeal a loss. The plaintiff P knows the true probability of $s=1$ is still $\frac{1}{2}$, of course, so they too will not appeal a loss in court. From P's (accurate) perspective, there is a $\frac{1}{2}(1-\tau)$ chance that only H^D will flip in court so P wins, a $\frac{1}{2}\tau$ chance that only G^P will be exposed and P will lose, and a $\frac{1}{2}$ chance that the case goes to a court decision in which case there is a 50-50 chance of a win and a loss for P. That is, P's expected profit in this deviation, denoted $E\pi^{P'}_2$, is:

$$E\pi^{P'}_2 = \frac{1}{2}(1-\tau)\pi^P_{CW} + \frac{1}{2}\tau\pi^P_{CL} + \frac{1}{4}\left(\pi^P_{CW}+\pi^P_{CL}\right)$$

In the event of case 2 – which occurs with probability $2\rho(1-\rho)$ conditional on P receiving x^P_0 – the gain to P from following the equilibrium strategy (that is, the loss from the deviation) is:

$$\begin{aligned} \Delta^{P'}_2 \equiv E\pi^P_2 - E\pi^{P'}_2 &= \frac{1}{4}\left(\pi^P_{CW}+\pi^P_{CL}\right) - \frac{1}{2}\pi^P_{CW} + \frac{1}{2}\tau\left(\pi^P_{CW}-\pi^P_{CL}\right) \\ &= \frac{1}{4}(1-2\tau)\left(\pi^P_{CL}-\pi^P_{CW}\right) < 0 \end{aligned}$$

Turning to case 4 in which D gets an encouraging signal, D would appeal (and win) in equilibrium but now, seeing G^P, infers that P is confident and so will not appeal a loss in court. P knows that the true probability of $s=1$ is $(1-\rho_1)$ still and so still will not appeal a loss in court in this case. So P perceives a $\tau(1-\tau)$ chance that one or other of the parties' hired guns will be exposed alone and the other party will win and a $1-\tau(1-\tau)$ of it going to a court decision, which will not be appealed by either party, giving a 50-50 chance of success. That is, P's expected profit in this deviation, denoted $E\pi^{P'}_4$, is:

$$E\pi^{P'}_4 = \tau(1-\tau)\left(\pi^P_{CW}+\pi^P_{CL}\right) + \frac{1}{2}(1-2\tau(1-\tau))\left(\pi^P_{CW}+\pi^P_{CL}\right) = \frac{1}{2}\left(\pi^P_{CW}+\pi^P_{CL}\right)$$

In the event of case 4 – which occurs with probability $\{\rho^2+(1-\rho)^2\}$ conditional on P receiving x^P_0 – the gain to P from following the equilibrium strategy (that is, the loss from the deviation) is:

$$\begin{aligned}\Delta_4^{P'} \equiv E\pi_4^P - E\pi_4^{P'} &= \left(\tau(1-\rho_1) - \frac{1}{2}\right)\pi_{CW}^P + \frac{1}{2}\left(\rho_1 - \tau\right)\pi_{CL}^P \\ &- \frac{1}{2}\left(1 - \rho_1 - \tau + 2\tau\rho_1\right)\pi_{AW}^D < 0\end{aligned}$$

The signs here follow because $\rho_1 > \rho > \frac{1}{2} > \tau$.

In sum, this deviation is attractive to P no matter the signal received by D; there can be no separating PBE of the sort conjectured here.

A.2.2 Pooling equilibria

There are two possible candidates for symmetric pooling equilibria in pure strategies: one in which both types (confident and unconfident) choose an honest expert and one in which they both choose a hired gun. We consider these in turn.

A. Pooling: both types choose H

Suppose that the players always retain an honest expert, regardless of their signal, will appeal a loss in court if they receive an encouraging signal and will settle a potential appeal by a rival if not. On the equilibrium path, then, there can be no updating of prior beliefs about the state of the world and the simple priors persist, wherein an encouraging signal gives a player the belief ρ that their favored state prevails and a discouraging signal reduces this to $(1-\rho)$. Specifically, the beliefs of player $i = P, D$ about the probability that $s = 1$ – i.e. that the state of the world favors P – can be represented as $x_1^i \to \rho$, $x_0^i \to (1-\rho)$.

Player P can no longer infer the exact state of the world from their own signal and D's observed expert choice, so their information partition, in terms of our earlier labeling of the states, is $\{(1,3),(2,4)\}$. Consider the first of these, in which P receives signal x_1^P. This means that P is confident and believes the chance of their H^P flipping is only $(1-\rho)$ whereas that of H^D flipping is ρ. If neither (or both) of these events occur then the court decides in favor of one party or the other 50-50. If that occurs, P knows there is a $2\rho(1-\rho)$ chance that they are in case 1, conditional on x_1^P, and a $\{\rho^2 + (1-\rho)^2\}$ chance of being in case 3. In the former case (state 1) both parties would appeal a loss and neither would settle a prospective appeal (and both parties would end up losing any such appeal, in fact) and in the latter case (state 3) only P would appeal a loss and, as they would win it, D would settle (D's information partition is $\{(1,4),(2,3)\}$, note.) So the expected payoff to P following the court's decision in this setting, denoted A_{13}^P, is:

$$\begin{aligned}A_{13}^P &= 2\rho(1-\rho)\left(\frac{1}{2}\pi_{AW}^P + \frac{1}{2}\pi_{AL}^P\right) + \{\rho^2 + (1-\rho)^2\}\left(\frac{1}{2}\pi_{AW}^P + \frac{1}{2}\pi_{CW}^P\right) \\ &= \frac{1}{2}\left(\pi_{AW}^P + 2\rho(1-\rho)\pi_{AL}^P + \{\rho^2 + (1-\rho)^2\}\pi_{CW}^P\right)\end{aligned}$$

The overall expected equilibrium payoff to P following x_1^P is then:

$$E\pi_{13}^P = \rho^2\pi_{CW}^P + (1-\rho)^2\pi_{CL}^P + 2\rho(1-\rho)A_{13}^P$$

If, instead, P receives signal x_0^P then they are not confident and believe the chance of H^D flipping is only $(1-\rho)$ whereas that of their H^P flipping is ρ. If neither (or both) of these events occur then the court once more decides in favor of one party or the other 50-50. If that occurs, P knows there is a $2\rho(1-\rho)$ chance that they are in case 2, conditional on x_0^P, and a $\{\rho^2 + (1-\rho)^2\}$ chance of being in case 4. In the former case (state 2) both parties are unconfident and neither would appeal a loss and in the latter case (state 4) only D is confident and so would appeal a loss and, as they would win it, P would settle. So the expected payoff to P following the court's decision in this setting, denoted A_{24}^P, is:

$$\begin{aligned}
A_{24}^P &= 2\rho(1-\rho)\left(\frac{1}{2}\pi_{CW}^P + \frac{1}{2}\pi_{CL}^P\right) + \{\rho^2 + (1-\rho)^2\}\left(\frac{1}{2}\pi_{CL}^P - \frac{1}{2}\pi_{AW}^D\right) \\
&= \frac{1}{2}\left(\pi_{CL}^P + 2\rho(1-\rho)\pi_{CW}^P - \{\rho^2 + (1-\rho)^2\}\pi_{AW}^D\right)
\end{aligned}$$

The overall expected equilibrium payoff to P following x_0^P is then:

$$\begin{aligned}
E\pi_{24}^P &= \rho^2\pi_{CL}^P + (1-\rho)^2\pi_{CW}^P + 2\rho(1-\rho)A_{24}^P \\
&= \rho\pi_{CL}^P + (1-\rho)^2(1+2\rho^2)\pi_{CW}^P - \rho(1-\rho)\{\rho^2 + (1-\rho)^2\}\pi_{AW}^D
\end{aligned}$$

For this to constitute a PBE it must be the case that neither player has a better response to the equilibrium strategy of its rival, so we now consider deviations. In contrast to the separating case, the players now cannot rely on Bayesian updating in observing an action off the equilibrium path, so we consider alternative beliefs a player might attach to the type of rival that has deviated.

Suppose that P deviates to a G and D attaches probability $s \in [0,1]$ to this deviation coming from a confident P receiving x_1^P (and so $(1-s)$ to it coming from an unconfident P receiving the signal x_0^P.) If D were to lose in court and appeal that decision – something it would only do if it is confident itself, following the equilibrium strategy having received signal x_0^D – then its expected profits would be $\pi_A^D = s\pi_{AL}^D + (1-s)\pi_{AW}^D$, as it would lose such an appeal against a confident rival and have the appeal settled by an unconfident one. So D will appeal a loss if and only if this expression exceeds the payoff from not appealing, π_{CL}^D. Rearranging, D will appeal a court loss *iff*:

$$s \leq s^{D*} \equiv \frac{\pi_{AW}^D - \pi_{CL}^D}{\pi_{AW}^D - \pi_{AL}^D}$$

Of course, if P observes an appeal from D then this perfectly identifies the state to P. Given x_0^P, for example, P knows an appeal by D will succeed so they will settle (and the offer of S in settlement reveals the true state to D as well, so P will have to offer π_{AW}^D as before, not π_A^D.)

Consider a deviation by G whereby it chooses a hired gun G^P when it gets a negative signal (x_0^P.) So P knows we are in state 2 or 4. The expected payoff to P from this deviation now depends on D's signal and, if and only if D gets the signal x_0^D, on D's beliefs: if $x^D = x_1^D$ (so we are in state 2) then D will not appeal a loss, regardless of their belief's about the type of deviant. But in state 4, if the case is decided in P's favor on a coin toss by the court of first instance and we denote P's payoff by π_{24}^{P*} then this will either be $-\pi_{AW}^D$ if $s \leq s^{D*}$ or π_{CW}^P if $s > s^{D*}$. From P's perspective, unable to distinguish state 2 from state 4, it believes that there is a $(1-\tau)(1-\rho)$ chance that only H^D will flip in court yielding a payoff of π_{CW}^P, a $\tau\rho$ chance that only G^P will be exposed, for a payoff of π_{CL}^P, and a $(\rho+\tau-2\tau\rho)$ chance that the court will toss a coin, in which case P gets a payoff denoted $A_{24}^{P'}$. But that payoff is the convex combination of the payoffs in states 2 and 4 where the weights are the probabilities of those two states, conditional on the signal x_0^P. That is,

$$A_{24}^{P'} = 2\rho(1-\rho)\left(\frac{1}{2}\pi_{CW}^P + \frac{1}{2}\pi_{CL}^P\right) + \{\rho^2 + (1-\rho)^2\}\left(\frac{1}{2}\pi_{CL}^P + \frac{1}{2}\pi_{24}^{P*}\right)$$

where

$$\pi_{24}^{P*} = \begin{cases} -\pi_{AW}^D & \textit{if } s \leq s^{D*} \\ \pi_{CW}^P & \textit{if } s > s^{D*} \end{cases}$$

Overall, then, P's expected payoff from this deviation is:

$$E\pi_{24}^{P'} = (1-\tau)(1-\rho)\pi_{CW}^P + \tau\rho\pi_{CL}^P + (\rho+\tau-2\tau\rho)A_{24}^{P'}$$

We now consider whether it is profitable to P or not, depending on D's beliefs.

(i) Suppose $s > s^{D*}$
Here we have $\pi_{24}^{P*} = \pi_{CW}^P$ so

$$A_{24}^{P'} = \left(\rho(1-\rho) + \frac{1}{2}\{\rho^2 + (1-\rho)^2\}\right)\left(\pi_{CW}^P + \pi_{CL}^P\right) = \frac{1}{2}\left(\pi_{CW}^P + \pi_{CL}^P\right)$$

and

$$E\pi_{24}^{P'} = (1-\tau)(1-\rho)\pi_{CW}^P + \tau\rho\pi_{CL}^P + \frac{1}{2}(\rho+\tau-2\tau\rho)\left(\pi_{CW}^P + \pi_{CL}^P\right)$$

The loss from the deviation, then, is:

$$\begin{aligned} \Delta_{24}^{P'} \equiv E\pi_{24}^P - E\pi_{24}^{P'} &= (1-\rho)\left((1-\rho)(1+2\rho^2) - (1-\tau)\right)\pi_{CW}^P + \rho(1-\tau)\pi_{CL}^P \\ &- \rho(1-\rho)\{\rho^2 + (1-\rho)^2\}\pi_{AW}^D - \frac{1}{2}(\rho+\tau-2\tau\rho)\left(\pi_{CW}^P + \pi_{CL}^P\right) \end{aligned}$$

Note that $(1-\rho)(1+2\rho^2)-(1-\tau)=\tau-\rho(1-2\rho(1-\rho))\leq\tau-\frac{1}{2}\rho\leq 0$ for $\tau\leq\frac{1}{4}$ so the coefficient on π^P_{CW} is negative. π^P_{CL} is negative, π^D_{AW} is positive, $\left(\pi^P_{CW}+\pi^P_{CL}\right)$ is positive and the bracketed coefficient on it is $(\rho+\tau-2\tau\rho)=(\rho(1-\tau)+\tau(1-\rho))$ and is also positive. Overall, then, this expression is negative and the deviation is profitable with these beliefs of D's.

(ii) Suppose $s\leq s^{D*}$
Here we have $\pi^{P*}_{24}=-\pi^D_{AW}$ so

$$A^{P'}_{24}=2\rho(1-\rho)\left(\frac{1}{2}\pi^P_{CW}+\frac{1}{2}\pi^P_{CL}\right)+\{\rho^2+(1-\rho)^2\}\left(\frac{1}{2}\pi^P_{CL}-\frac{1}{2}\pi^D_{AW}\right)=A^P_{24}$$

and

$$E\pi^{P'}_{24}=(1-\tau)(1-\rho)\pi^P_{CW}+\tau\rho\pi^P_{CL}+(\rho+\tau-2\tau\rho)A^P_{24}$$

The loss from the deviation, then, is:

$$\begin{aligned}\Delta^{P'}_{24}\equiv E\pi^P_{24}-E\pi^{P'}_{24} &= (1-\rho)\left((1-\rho)-(1-\tau)\right)\pi^P_{CW}+\rho(\rho-\tau)\pi^P_{CL}\\ &+ \left(2\rho(1-\rho)-(\rho+\tau-2\tau\rho)\right)A^P_{24}\\ &= (\rho-\tau)\left[\rho\pi^P_{CL}-(1-\rho)\pi^P_{CW}-(2\rho-1)A^P_{24}\right]\end{aligned}$$

We cannot sign this expression *a priori* but

$$A^P_{24}\Big|_{\rho=1}=\frac{1}{2}\left(\pi^P_{CL}-\pi^D_{AW}\right)$$

so

$$\Delta^{P'}_{24}\Big|_{\rho=1}=(1-\tau)\left[\pi^P_{CL}-\frac{1}{2}\left(\pi^P_{CL}-\pi^D_{AW}\right)\right]=\frac{1}{2}(1-\tau)\left(\pi^P_{CL}+\pi^D_{AW}\right)$$

This is the exact negative of the condition discussed in section A.1.1: $\left(\pi^P_{CL}+\pi^D_{AW}\right)=\left(W^D-L^P\right)-(2f_C+(1-\lambda)f_A)$. Consequently, this deviation can also be profitable even with these beliefs of D's, if ρ is sufficiently high and court costs are sufficiently high (and the parties are sufficiently symmetric. If one party's gain from winning were exactly equal to its rivals loss from losing – both net of court costs – then this deviation would definitely be profitable.)

We next consider a deviation by G whereby it chooses a hired gun G^P when it gets a *positive* signal (x^P_1). So P now knows they are in state 1 or 3. Suppose again that D attaches probability $s\in[0,1]$ to this deviation coming from a confident P (receiving x^P_1) and $(1-s)$ to it coming from an unconfident P. As before, D will appeal a loss if and only if $x^D=x^D_0$ and $s\leq s^{D*}$. Given x^P_1, P knows an appeal by D will fail so they will not settle any such appeal. Furthermore, P is confident and so will appeal any loss in court.

In state 1 that appeal will not be settled by D and P will lose it and in state 3 D will settle the appeal.

Proceeding as previously, if the case is decided in P's favor on a coin toss by the court of first instance in actual state 1 and we denote P's payoff then by π_{13}^{P*} then this will either be π_{AW}^{P} if $s \leq s^{D*}$ (because D will lose *any* appeal in states 1 or 3) or π_{CW}^{P} if $s > s^{D*}$. From P's perspective, unable to distinguish state 1 from state 3, it believes that there is a $\rho(1-\tau)$ chance that only H^D will flip in court yielding a payoff of π_{CW}^{P}, a $\tau(1-\rho)$ chance that only G^P will be exposed, for a payoff of π_{CL}^{P}, and a $(1-\rho-\tau+2\tau\rho)$ chance that the court will toss a coin, in which case P gets a payoff denoted $A_{13}^{P'}$. But that payoff is the convex combination of the payoffs in states 1 and 3 where the weights are the probabilities of those two states, conditional on the signal x_1^P. If the true state is state 1 then if P loses in court they will appeal the loss and lose the appeal for a payoff of π_{AL}^{P} and if P wins in court then the payoff depends on D's decision. In state 3 a loss in court leads P to appeal and that appeal will be settled by D, and a win in court will not be appealed. That is,

$$A_{13}^{P'} = 2\rho(1-\rho)\left(\frac{1}{2}\pi_{AL}^{P} + \frac{1}{2}\pi_{13}^{P*}\right) + \{\rho^2 + (1-\rho)^2\}\left(\frac{1}{2}\pi_{AW}^{P} + \frac{1}{2}\pi_{CW}^{P}\right)$$

where

$$\pi_{13}^{P*} = \begin{cases} \pi_{AW}^{P} & \textit{if } s \leq s^{D*} \\ \pi_{CW}^{P} & \textit{if } s > s^{D*} \end{cases}$$

Overall, then, P's expected payoff from this deviation is:

$$E\pi_{13}^{P'} = \rho(1-\tau)\pi_{CW}^{P} + \tau(1-\rho)\pi_{CL}^{P} + (1-\rho-\tau+2\tau\rho)A_{13}^{P'}$$

We now consider the two different cases, depending on D's beliefs.

(i) Suppose $s \leq s^{D*}$
Here we have $\pi_{13}^{P*} = \pi_{AW}^{P}$ so

$$A_{13}^{P'} = \frac{1}{2}\left[\pi_{AW}^{P} + 2\rho(1-\rho)\pi_{AL}^{P} + \{\rho^2 + (1-\rho)^2\}\pi_{CW}^{P}\right] = A_{13}^{P}$$

Consequently,

$$E\pi_{13}^{P'} = \rho(1-\tau)\pi_{CW}^{P} + \tau(1-\rho)\pi_{CL}^{P} + (1-\rho-\tau+2\tau\rho)A_{13}^{P}$$

and the loss to P from the deviation is:

$$\begin{aligned} \Delta_{13}^{P'} \equiv E\pi_{13}^{P} - E\pi_{13}^{P'} &= (\rho-(1-\tau))\rho\pi_{CW}^{P} + (1-\rho)(1-\rho-\tau)\pi_{CL}^{P} \\ &+ (2\rho-1)(1-\rho-\tau)A_{13}^{P} \end{aligned}$$

We cannot sign this expression *a priori* but note that,

$$\Delta_{13}^{P'}\Big|_{\rho=1} = \tau\left(\pi_{CW}^{P} - A_{13}\right) = \frac{1}{2}\tau)\left(\pi_{CW}^{P} - \pi_{AW}^{P}\right) \geq 0$$

where the second equality follows from the evaluation of A_{13} at $\rho = 1$. Thus the deviation will be unattractive when ρ is high. Also,

$$\Delta_{13}^{P'}\Big|_{\rho=\frac{1}{2}} = \frac{1}{2}\tau\left(\pi_{CL}^{P} - \pi_{CW}^{P}\right) < 0$$

so the deviation is profitable when ρ is low.

(ii) Suppose, instead, that $s > s^{D*}$
Here we have $\pi_{13}^{P*} = \pi_{CW}^{P}$ so, compared to the exercise just undertaken, this deviation is more attractive. Unsurprisingly, then, it is profitable when ρ is low and we can also show that it is profitable when ρ is high.

In this setting we have:

$$A_{13}^{P'} = \frac{1}{2}\left[\pi_{CW}^{P} + 2\rho(1-\rho)\pi_{AL}^{P} + \{\rho^2 + (1-\rho)^2\}\pi_{AW}^{P}\right]$$

Consequently,

$$E\pi_{13}^{P'} = \rho(1-\tau)\pi_{CW}^{P} + \tau(1-\rho)\pi_{CL}^{P} + (1-\rho-\tau+2\tau\rho)A_{13}^{P'}$$

and the loss to P from the deviation is:

$$\begin{aligned}\Delta_{13}^{P'} &= (\rho-(1-\tau))\rho\pi_{CW}^{P} + (1-\rho)(1-\rho-\tau)\pi_{CL}^{P} \\ &+ \rho(1-\rho)\left(\pi_{AW}^{P} + 2\rho(1-\rho)\pi_{AL}^{P} + \{\rho^2 + (1-\rho)^2\}\pi_{CW}^{P}\right) \\ &- \frac{1}{2}(1-\rho-\tau+2\tau\rho)\left[\pi_{CW}^{P} + 2\rho(1-\rho)\pi_{AL}^{P} + \{\rho^2 + (1-\rho)^2\}\pi_{AW}^{P}\right]\end{aligned}$$

From this,

$$\Delta_{13}^{P'}\Big|_{\rho=1} = \frac{1}{2}\tau\left(\pi_{CW}^{P} - \pi_{AW}^{P}\right) \geq 0$$

Thus the deviation will be unattractive when ρ is high. Also,

$$\Delta_{13}^{P'}\Big|_{\rho=\frac{1}{2}} = \frac{1}{2}\left[\left(-\frac{3}{4} - \tau\right)\pi_{CW}^{P} + \left(\frac{1}{2} - \tau\right)\pi_{CL}^{P} - \pi_{AW}^{P} + \frac{3}{4}\pi_{AL}^{P}\right] < 0$$

so, as claimed, the deviation is profitable when ρ is low.

B. Pooling: both types choose G
Suppose, instead, that the players always retain a hired gun exert, regardless of their

signal, will appeal a loss in court if they receive an encouraging signal and will settle a potential appeal by a rival if not. On the equilibrium path, again, there can be no updating of prior beliefs about the state of the world and the simple priors persist, the beliefs of player $i = P, D$ that the state favors P being once more represented as $x_1^i \to \rho$, $x_0^i \to (1-\rho)$. Equilibrium payoffs here are isomorphic to those in the previous pooling equilibrium analysis, but with different probabilities attached to the outcomes. In brief, when P's signal is x_1^P and P is confident,

$$E\pi_{13}^P = \tau(1-\tau)\pi_{CW}^P + \tau(1-\tau)\pi_{CL}^P + (1-2\tau(1-\tau))A_{13}^P$$

where, as previously,

$$A_{13}^P = \frac{1}{2}\left(\pi_{AW}^P + 2\rho(1-\rho)\pi_{AL}^P + \{\rho^2 + (1-\rho)^2\}\pi_{CW}^P\right)$$

If, instead, P receives signal x_0^P then they are not confident and believe the chance of $s = 1$ is only $(1-\rho)$. Then:

$$E\pi_{24}^P = \tau(1-\tau)\pi_{CW}^P + \tau(1-\tau)\pi_{CL}^P + (1-2\tau(1-\tau))A_{24}^P$$

where, as before,

$$A_{24}^P = \frac{1}{2}\left(\pi_{CL}^P + 2\rho(1-\rho)\pi_{CW}^P - \{\rho^2 + (1-\rho)^2\}\pi_{AW}^D\right)$$

Now consider a deviation by G whereby it chooses an honest expert H^P when it gets a positive signal (x_1^P.) So P knows we are in state 1 or 3. The expected payoff to P from this deviation now depends on D's signal and, if and only if D gets the signal x_0^D, on D's beliefs: if $x^D = x_1^D$ (so we are in state 3) then D will not appeal a loss, regardless of their belief's about the type of deviant. But in state 1, if the case is decided in P's favor on a coin toss by the court of first instance and we denote P's payoff by π_{13}^{P*} then this will either be $-\pi_{AW}^D$ if $s \leq s^{D*}$ or π_{CW}^P if $s > s^{D*}$. From P's perspective, unable to distinguish state 1 from state 3, it believes that there is a $(1-\tau)(1-\rho)$ chance that only its own H^P will flip in court yielding a payoff of π_{CL}^P, a $\tau\rho$ chance that only G^D will be exposed, for a payoff of π_{CW}^P, and a $(\rho + \tau - 2\tau\rho)$ chance that the court will toss a coin, in which case P gets a payoff denoted $A_{13}^{P'}$. But that payoff is the convex combination of the payoffs in states 1 and 3 where the weights are the probabilities of those two states, conditional on the signal x_1^P. That is,

$$A_{13}^{P'} = 2\rho(1-\rho)\left(\frac{1}{2}\pi_{13}^{P*} + \frac{1}{2}\pi_{AL}^P\right) + \{\rho^2 + (1-\rho)^2\}\left(\frac{1}{2}\pi_{AW}^P + \frac{1}{2}\pi_{CW}^P\right)$$

where

$$\pi_{13}^{P*} = \begin{cases} \pi_{AW}^P & \mathit{if}\ s \leq s^{D*} \\ \pi_{CW}^P & \mathit{if}\ s > s^{D*} \end{cases}$$

We now consider whether this deviation is profitable for P or not, depending on D's beliefs.

(i) Suppose $s > s^{D*}$
Here we have $\pi_{13}^{P*} = \pi_{CW}^{P}$ so

$$A_{13}^{P'} = \frac{1}{2}\pi_{CW}^{P} + \frac{1}{2}\{\rho^2 + (1-\rho)^2\}\pi_{AW}^{P} + \rho(1-\rho)\pi_{AL}^{P}$$

and

$$E\pi_{13}^{P'} = (1-\tau)(1-\rho)\pi_{CL}^{P} + \tau\rho\pi_{CW}^{P} + (\rho+\tau-2\tau\rho)A_{13}^{P'}$$

The loss from the deviation, then, is, as before,

$$\Delta_{13}^{P'} \equiv E\pi_{13}^{P} - E\pi_{13}^{P'}$$

The full expansion of this yields an unedifying expression but we can show that, evaluated at $\rho = 1$,

$$A_{13}^{P}\Big|_{\rho=1} = A_{13}^{P'}\Big|_{\rho=1} = \frac{1}{2}\left(\pi_{CW}^{P} + \pi_{AW}^{P}\right) > 0$$

$$E\pi_{13}^{P'}\Big|_{\rho=1} = \tau(1-\tau)\left(\pi_{CW}^{P} + \pi_{AW}^{P}\right) + (1-2\tau(1-\tau))A_{13}^{P}\Big|_{\rho=1}$$

$$E\pi_{13}^{P}\Big|_{\rho=1} = \tau\pi_{CW}^{P} + (1-\tau)A_{13}^{P}\Big|_{\rho=1}$$

Thus,

$$\Delta_{13}^{P'}\Big|_{\rho=1} = -\tau^2\pi_{CW}^{P} + \tau(1-\tau)\pi_{CL}^{P} - \tau(1-2\tau)A_{13}^{P}\Big|_{\rho=1} < 0$$

That is, the deviation is profitable with these beliefs of D's when ρ is high (and $\tau \neq 0$.)

(ii) Suppose $s \leq s^{D*}$
Here we have $\pi_{13}^{P*} = \pi_{AW}^{P}$ so

$$A_{13}^{P'} = \rho(1-\rho)\left(\pi_{AW}^{P} + \pi_{AL}^{P}\right) + \frac{1}{2}\{\rho^2 + (1-\rho)^2\}\left(\pi_{CW}^{P} + \pi_{AW}^{P}\right) = A_{13}^{P}$$

and

$$E\pi_{13}^{P'} = (1-\tau)(1-\rho)\pi_{CL}^{P} + \tau\rho\pi_{CW}^{P} + (\rho+\tau-2\tau\rho)A_{13}^{P}$$

The loss from the deviation, then, is:

$$\Delta_{13}^{P'} \equiv E\pi_{13}^{P} - E\pi_{13}^{P'}$$

and, again, the full expansion of this is rather unilluminating. But

$$A_{13}^{P}\Big|_{\rho=1} = \frac{1}{2}\left(\pi_{AW}^{P} + \pi_{CW}^{P}\right) > 0$$

so, again,

$$\Delta_{13}^{P'}\big|_{\rho=1} = -\tau^2\pi_{CW}^P + \tau(1-\tau)\pi_{CL}^P - \tau(1-2\tau)A_{13}^P\big|_{\rho=1} < 0$$

That is, the deviation is also profitable with these beliefs of D's when ρ is high (and $\tau \neq 0$.)

In sum, when ρ is high and $\tau \neq 0$, this deviation is always profitable, no matter the beliefs of D regarding the type of deviant P, so the proposed equilibrium fails.

Finally, consider instead a deviation to H^P by an *un*confident P. This follows x_0^P and so P knows they are in either state 2 or 4. In case 2, when D gets an unpromising signal, it will not appeal any loss in court, but it will do so in state 4 if it is sufficiently confident that any observed deviation comes from an unconfident P; that is, if $s \leq s^{D*}$. Proceeding in the now familiar manner, for P this deviation yields:

$$E\pi_{24}^{P'} = \tau(1-\rho)\pi_{CW}^P + \rho(1-\tau)\pi_{CL}^P + (1-\rho-\tau+2\tau\rho)A_{24}^P$$

where

$$A_{24}^{P'} = \frac{1}{2}\pi_{CL}^P + \rho(1-\rho)\pi_{CW}^P + \frac{1}{2}\{\rho^2 + (1-\rho)^2\}\pi_{24}^{P*}$$

and

$$\pi_{24}^{P*} = \begin{cases} -\pi_{AW}^D & \textit{if } s \leq s^{D*} \\ \pi_{CW}^P & \textit{if } s > s^{D*} \end{cases}$$

(i) Suppose $s > s^{D*}$
Here we have $\pi_{24}^{P*} = \pi_{CW}^P$ so

$$A_{24}^{P'} = \frac{1}{2}\pi_{CL}^P + \rho(1-\rho)\pi_{CW}^P + \frac{1}{2}\{\rho^2 + (1-\rho)^2\}\pi_{CW}^P = \frac{1}{2}\left(\pi_{CW}^P + \pi_{CL}^P\right)$$

and

$$E\pi_{24}^{P'} = \tau(1-\rho)\pi_{CW}^P + \rho(1-\tau)\pi_{CL}^P + \frac{1}{2}(1-\rho-\tau+2\tau\rho)\left(\pi_{CW}^P + \pi_{CL}^P\right)$$

The loss from the deviation, then, is, as before,

$$\Delta_{24}^{P'} \equiv E\pi_{24}^P - E\pi_{24}^{P'}$$

and, as before, the expansion of this expression yields little of analytic value and is not reproduced here.

(ii) Suppose $s \leq s^{D*}$
Here we have $\pi_{24}^{P*} = -\pi_{AW}^D$ so $A_{24}^{P'} = A_{24}^P$ and

$$E\pi_{24}^{P'} = \tau(1-\rho)\pi_{CW}^P + \rho(1-\tau)\pi_{CL}^P + (1-\rho-\tau+2\tau\rho)A_{24}^P$$

The loss from the deviation, then, is, as before,

$$\Delta_{24}^{P'} \equiv E\pi_{24}^P - E\pi_{24}^{P'}$$

and, again, the expansion of this expression yields little of analytic value and is not reproduced here.

The lack of analytic results here points to an ambiguity that we address in the numerical simulations.

As noted in the paper, however, this proposed pooling equilibrium can definitely survive under certain conditions. In particular, suppose D attaches a high belief to a deviation coming from an unconfident P – that is, $s \leq s^{D*}$ – and that a hired gun is never exposed: $\tau = 0$. Again, consider first a deviation by a confident P. We have $E\pi_{13}^{P}\big|_{\tau=0} = A_{13}^{P}$ and $E\pi_{13}^{P'}\big|_{\tau=0} = (1-\rho)\pi_{CL}^{P} + \rho A_{13}^{P}$ so $\Delta_{13}^{P'}\big|_{\tau=0} = (1-\rho)\left(A_{13}^{P} - \pi_{CL}^{P}\right)$ and if this term is positive then the deviation is unattractive. Turning to a deviation by an *un*confident P, we have $E\pi_{24}^{P}\big|_{\tau=0} = A_{24}^{P}$ and $E\pi_{24}^{P'}\big|_{\tau=0} = \rho\pi_{CL}^{P} + (1-\rho)A_{24}^{P}$ so $\Delta_{24}^{P'}\big|_{\tau=0} = \rho\left(A_{24}^{P} - \pi_{CL}^{P}\right)$ and if this term is positive then the deviation is unattractive. So this pooling equilibrium might survive under certain (permissible) beliefs when τ is low.

A.3 The "litigate or settle" decision

As noted, when ρ is very high, both parties are essentially in agreement about the 'correct' outcome of the case so, if both parties get signals favoring the defendant (plaintiff), we would anticipate that the plaintiff (defendant) is less likely to litigate (contest the suit). Endogenizing the litigation decision is then likely to truncate from above the range of ρ over which litigation would occur and thus reduce the space in which the separating equilibrium might prevail.

Suppose there were a further couple of stages inserted into the game analyzed here in which, first, the plaintiff (P) decided whether or not to litigate the case and, second, if a case were to be initiated, the defendant (D) decides whether to settle or proceed to court. Under our maintained assumption that a party would wish to go to court facing a 50-50 chance of success, this extension will only be potentially of interest if it occurs *after* the parties receive their signals, clearly, and form posterior beliefs concerning the true state of the world – i.e. concerning their chances of success in the case. It is clear that P would still wish to litigate after receiving an encouraging signal (x_1^P) as their posteriors then exceed their 50-50 priors. But they may also wish to proceed even if they receive a discouraging signal (x_0^P): if D were also to have received a discouraging signal (x_1^D) then P would correctly believe they still had a 50% chance of success. The probability of $x^D = x_1^D$ conditional on $x^P = x_0^P$ is decreasing in ρ,[31] so this is more likely the lower is ρ, i.e. the less accurate are the signals. Suppose that P pursues a strategy of only litigating, after $x^P = x_0^P$, if ρ is less than some threshold value, say ρ_P^t, and always litigating if $x^P = x_1^P$. Player D, then, as ρ is common knowledge, knows that if a case is

[31]This probability is $2\rho(1-\rho)$ and, given $\rho \geq \frac{1}{2}$, it reaches a maximum (of $\frac{1}{2}$) at $\rho = \frac{1}{2}$.

initiated and (i) $\rho > \rho_P^t$ then P is confident. If D were also confident ($x^D = x_0^D$) then they would not settle the case but, in the (conditionally) more likely case that they were not confident, they would choose to settle. In this case, then, if a case actually proceeds to trial then both parties know that they have each received encouraging signals so there can be no updating of priors away from 50-50. No appeals will be pursued and the subsequent choice of expert witness type is completely uninformative and can fill no signaling role. On the other hand, if a case is initiated by P and (ii) $\rho \leq \rho_P^t$ then D learns nothing of P's signal. The incentives facing D regarding settlement or proceeding are isomorphic to those determining P's initial filing – they would prefer to proceed if confident and would still proceed even if unconfident if the chances that their rival is also unconfident are sufficiently high. Suppose D also pursues a strategy of only litigating, after $x^D = x_1^D$ if ρ is less than some threshold value, say ρ_D^t, and always litigating if $x^D = x_0^D$. If the parties are completely symmetric then $\rho_D^t = \rho_P^t$ and the case proceeding to trial in this case leaves each party uninformed about its rival's signal.

In sum, a modification along these lines, with the parties playing these 'threshold' strategies,[32] suggests that our analysis applies only if ρ is not too high. In a sense this makes the separating equilibrium less likely.

[32] Whether or not such strategies are equilibrium strategies is an open question. If an unconfident P, for example, by litigating even when ρ exceeds the conjectured threshold, can persuade D that they are confident, then they can dissuade D from appealing a loss in court when they otherwise might appeal. This might be attractive to P.