BETA
Bureau d'économie théorique et appliquée

Documents de travail

« On Lawyer Compensation When Appeals Are Possible »

Auteurs

Christian At, Tim Friehe, Yannick Gabuthy

Document de Travail n° 2018 – 17

Mars 2018

Bureau d'Économie Théorique et Appliquée

BETA Université de Strasbourg
Faculté des sciences économiques et de gestion
61 avenue de la Forêt Noire
67085 Strasbourg Cedex
Tél. : +33 (0)3 68 85 20 69
Fax : +33 (0)3 68 85 20 70
Secrétariat : Géraldine Del Fabbro
g.delfabbro@unistra.fr

http://www.beta-umr7522.fr

On Lawyer Compensation When Appeals Are Possible

Christian At* Tim Friehe† Yannick Gabuthy‡

March 15, 2018

Abstract

This paper describes how plaintiff should compensate lawyers, who choose unobservable effort, when litigation may proceed from the trial to the appeals court. We find that, when it is very likely that the defendant will appeal, transfers made to the lawyer only after an appeals court's ruling are key instruments in incentivizing *both* trial and appeal court effort. Indeed, the lawyer may not receive any transfer after the trial court's ruling. In contrast, when reaching the appeals stage is unlikely, a favorable trial court ruling triggers a positive transfer to the lawyer and first-best appeals effort. In our setup, the lawyer may receive a lower transfer after winning in both the trial and the appeals court as compared to the scenario in which the first-instance court ruled against the plaintiff and the appeals court reversed that ruling.

Keywords: Litigation, Appeals, Moral hazard, Optimal contract.
JEL Codes: D82, K41.

*CRESE (University of Franche-Comté); 45, Avenue de l'Observatoire, 25030 Besançon, France. Email: christian.at@univ-fcomte.fr.

†Corresponding author; Public Economics Group (University of Marburg); Am Plan 2, 35037 Marburg, Germany. CESifo, Munich, Germany. EconomiX, Paris, France. Email: tim.friehe@uni-merburg.de.

‡BETA (CNRS, University of Strasbourg, University of Lorraine); 13, Place Carnot, C.O. 70026, 54035 Nancy, France. Email: yannick.gabuthy@univ-lorraine.fr.

1. Introduction

1.1. Motivation and main results. The appeals process – whereby litigants dissatisfied with the first-instance authority's judgment may bring their case to a higher authority – is a widely observed feature of judicial systems. For example, from 2001 to 2005, about 15% of civil trials – including tort, contract, and property cases – concluded in a large set of U.S. counties were reviewed by an appellate court after the first-instance verdict (Cohen, 2006).[1] The frequency of appeals was even higher in product liability and medical malpractice trials, where litigants filed appeals in about 33% and 18% of these cases, respectively. In France, in the year 2015, approximately 22% (68%) of cases brought before the major courts (labor courts) were appealed (Chambaz, 2017). Furthermore, appeals mechanisms are also ubiquitous outside of the judicial system since they are frequently used by administrative agencies, religious bodies, professional sports leagues, and many other organizations (Shavell, 1995).

This paper explores how litigants should respond to the importance of appeals in their attempts to incentivize their lawyers. Specifically, we describe the contract that a plaintiff should offer to her lawyer, who chooses unobservable effort, when the case may proceed to the appeals court after the trial court's judgment. In our setup, the lawyer selects a level of effort specific to the stage of adjudication and each court either rules in favor or against the plaintiff regarding the fixed award at stake. By considering a dynamic moral hazard problem, the present paper complements the very important literature on how best to overcome the moral hazard problem when the case is finally decided in the trial court. This literature usually deals with the contingent-fee regime (*e.g.*, Dana and Spier, 1993; Hay, 1997).

We find that the compensation contract offered by the plaintiff relies to a great extent on incentives that depend on the appeals court's judgment. We assume that payments after the appeal court's decision condition on the full history, that is, distinguish the scenario in which the plaintiff's lawyer won in trial court from the scenario in which she lost. This distinction creates incentives for trial court effort. In fact, we establish that, in some circumstances, transfers provided to the lawyer only after the appeals court's judgment fully substitute for positive transfers after the trial court's judgment (despite the presence of limited liability constraints regarding

[1] Eisenberg and Heise (2015), for example, report a ratio of 11.6% over the period 2005-2009.

the lawyer and the possibility that the appeals stage will not be reached). In the appeals stage, the lawyer's optimization regarding effort depends on the trial court's ruling because the transfer after winning the case in appeals court is contingent on the trial court's ruling and since winning in appeals court is easier for the plaintiff's lawyer when the trial court decided in favor of the plaintiff. The marginal cost effect makes it possible that the lawyer receives a smaller transfer after winning in both courts as compared to winning only in appeals court.

There are relatively few contributions analyzing the appeals process and its implications theoretically. Most of the existing literature on appeals is concerned with their effect on judges' choices or focuses on the losing litigant's incentives to file appeal (see Section 1.2). In our paper, we abstract from both issues and instead focus on the compensation contract between the plaintiff and her lawyer. In fact, very much in the spirit of the litigation contest literature (*e.g.*, Farmer and Pecorino, 2013), we consider the probability of winning to solely depend on effort. Moreover, for tractability, we assume exogenous probabilities for the filing of appeal.

1.2. Related literature. According to the seminal contribution by Shavell (1995), the appeals mechanism may be viewed as a means to correct errors in judicial decision-making. Assuming both that litigants possess information about the occurrence of legal errors and that appellate courts identify them, only erroneously decided cases are appealed and the accuracy of judicial decisions is thereby improved. Daughety and Reinganum (2000) extend this framework by assuming that the imperfectly informed judge – interested in choosing the socially desirable outcome – can draw inferences from the decision to appeal.[2] Spitzer and Talley (2000) uses a similar incomplete-information framework, but considers that trial and appeal deal with the same issue, whereas Daughety and Reinganum (2000) distinguish between the trial tribunal's focus on facts and the appeals court's focus on issues of law. Following a different behavioral perspective, Levy (2005) models opportunistic judges (with career concerns), and highlights that they can have incentives to provoke appeal in order to signal their talent and thus benefit from an enhanced reputation. However, as emphasized by Shavell (2006) and Iossa and Palumbo (2007), the threat of appeals may also serve as a disciplining device for such opportunistic adjudicators

[2]In a broader context, the adjudicator may also gather information from other sources. For instance, Oytana (2014) develops a model where the appellate court makes decisions on the basis of information provided by – potentially biased – experts.

by preventing them from deviating too much from the socially desirable award, since their desire is obviously to avoid reversal by the higher tribunal. In a different perspective, Wohlschlegel (2014) focuses on the litigants' behavior, and analyzes how the anticipation of appeals influences the likelihood of pre-trial and post-trial settlement between asymmetrically informed parties. Friehe and Wohlschlegel (2017) consider the possibility of appeals in the context of litigation contests, focusing on justice, effort, and filing incentives.

The present paper is most closely related to Ohlendorf and Schmitz (2012) and At and Gabuthy (2015) as both papers are also describing how compensation contracts can best address dynamic moral hazard. The first paper purposefully abstains from assuming a technological impact of a first-period success or failure on the second period, while we have to account for one since appeal court decisions build upon trial court decisions. Along similar lines, in Ohlendorf and Schmitz (2012), the moral hazard problem is repeated in the sense that there is a potential reward for the principal in the first and the second period. In our context, there is a payment for the plaintiff in the first period only if the case concludes after the trial court decision. Whereas Ohlendorf and Schmitz (2012) provide a more general contribution to the literature on principal-agent relationships, At and Gabuthy (2015) are also concerned with plaintiff-lawyer relationships. However, they consider 'sequential trials', that is, trials in which liability is determined first and the level of damages next. Sequential trials are common in mass tort cases, such as asbestos claims (White, 2002).

1.3. Plan of the paper. The remainder of the paper is organized as follows. Section 2 presents the model. Section 3 derives our main results concerning the plaintiff's compensation of the lawyer. Section 4 concludes and suggests some extensions. For ease of exposition, all proofs are relegated to the appendix.

2. The model

A risk-neutral plaintiff has suffered losses from an accident or a breach of contract and sues the defendant for damages. The dispute may concern, for example, whether the injurer *caused* the plaintiff's losses or whether the promisor is excused from the nonperformance of contractual duties due to impossibility. The case may reach the appeals court after the trial court's judgment. The plaintiff hires a risk-neutral lawyer for representation (as in Emons, 2006).

We consider the following timing of events (see Figure 1).[3] At date 0, the plaintiff makes a take-it-or-leave-it offer to the lawyer that concerns representation in both the trial court and the appeals court. We assume that the plaintiff can credibly commit not to renegotiate the contract after the trial court's decision. After accepting the contract, the lawyer chooses an unobservable effort level $e_1 \in [0, 1]$ at date 1. Litigation effort is a one-dimensional index of inputs such as attorney hours, pages of documentation, etc. The lawyer incurs a cost $c_1(e_1)$. At date 2, the trial court announces its verdict $y_1 \in \{0, 1\}$, where $y_1 = 1\,(0)$ denotes that the defendant is (not) found liable. The probability of winning is normalized to be equal to the effort level (*i.e.* $\mathbb{P}\{y_1 = 1|e_1\} = e_1$). After losing in trial court, the plaintiff by assumption always files for appeal. The defendant files for appeal with probability $q \in [0, 1]$, which is assumed to be exogenous and common knowledge. These are strong assumptions made to simplify the analysis. In other words, our game includes only the plaintiff and the lawyer as strategic players. After a trial court judgment in favor of the plaintiff (*i.e.*, $y_1 = 1$), the game thus ends with probability $1 - q$ with a transfer of damages $J > 0$ to the plaintiff. Otherwise, at date 3, the lawyer chooses an unobservable effort level $e_2 \in [0, 1]$ at a cost $c_{2y_1}(e_2)$ to influence the probability of winning the case in the appeals court. An appeals court judgment in favor of the (plaintiff) defendant is denoted $y_2 = 1$ ($y_2 = 0$), and implies a transfer of J (no transfer). We assume that the probability that the plaintiff succeeds in appeals court is given by $\mathbb{P}\{y_2 = 1|e_2\} = e_2$ and thus independent of the trial court's judgment. To reflect that appeals courts will to some extent be guided by the lower level court's selection and assessment of facts, for example, we let the cost of appeals court effort costs $c_{2y_1}(e_2)$ depend on the trial court's judgment $y_1 \in \{0, 1\}$, yielding $c_{20}(e_2)$ and $c_{21}(e_2)$, in a way made more precise below. Effectively, this is analogous to having a probability of winning depend on the previous judgment but not the cost of effort.

[3] We neglect discounting and assume that the plaintiff incurs no fixed cost in filing the lawsuit. These assumptions are made to alleviate notations and do not alter the gist of our arguments.

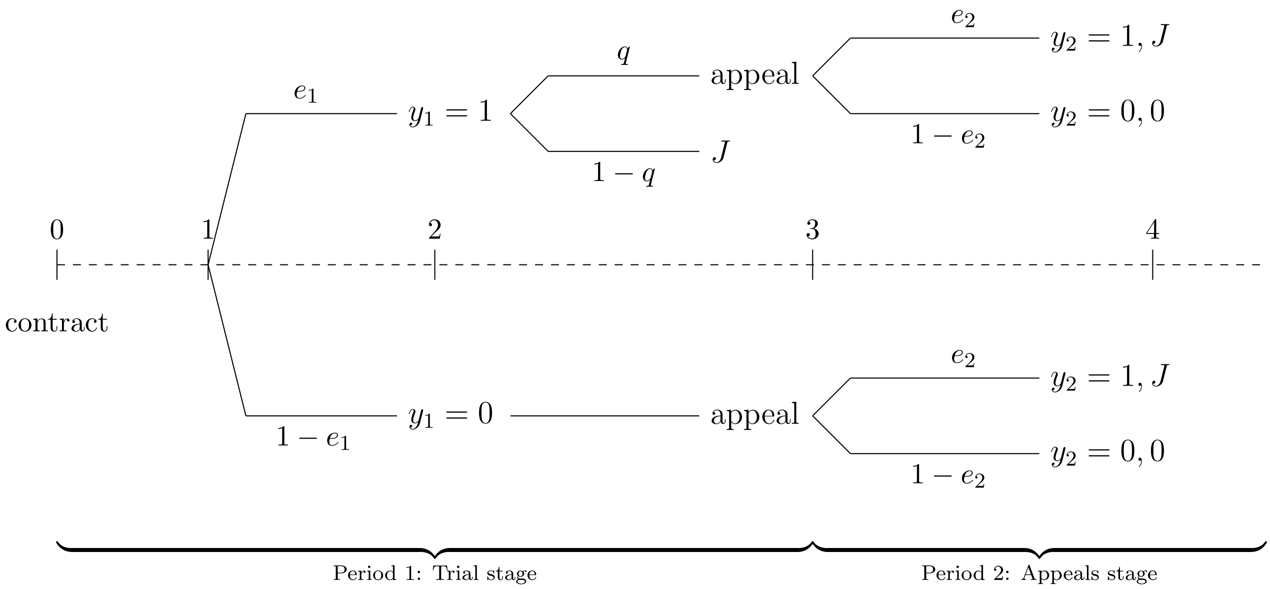

Figure 1: The sequence of events (with y_1/y_2 as the outcome in the trial/appeals court and $J/0$ as plaintiff gross payoff).

To be more precise regarding our assumptions about the cost of effort, we summarize as follows:

Assumption 1. *(i) With regard to the cost of trial court effort, we assume:* $c_1' \geq 0$, $c_1'' \geq 0$, $c_1''' \geq 0$, $c_1(0) = 0$, $c_1'(0) = 0$ *and* $c_1''(e_1) > 0$ *for all* $e_1 > 0$*;*

(ii) With regard to the cost of appeals court effort, we assume: $c_{2y_1}(0) = 0$, $c_{2y_1}'(0) = 0$, $c_{2y_1}'(e_2) \geq 0$, $c_{2y_1}''(e_2) \geq 0$, $c_{2y_1}'''(e_2) \geq 0$ *and* $c_{2y_1}''(e_2) > 0$ *for all* $e_2 > 0$*;* $c_{21}(.) < c_{20}(.)$, $c_{21}'(e_2) < c_{20}'(e_2)$ *and* $c_{21}'(1) \geq J$.

As is standard, we assume that the lawyer incurs no cost if she makes no effort and that her marginal costs are convex. The cost of appeals court effort depends on the trial court' verdict. We postulate that the lawyer's effort at the appeals stage is absolutely and marginally less costly after winning in trial court. As explained above, this can also be interpreted as a different way of formalizing that legal arguments will be more effective in persuading the appeals court when they have the backing of the trial court's judgment.

3. Optimal Lawyer Compensation

The plaintiff seeks to resolve a dynamic moral hazard problem. The lawyer's levels of effort in the trial court and the appeals court are unobservable and thus must be incentivized by outcome-contingent payments $t_1(y_1)$ (to be made at date 2) and $t_2(y_1, y_2)$ (to be made at date 4 when it is reached). Due to the lawyer's limited liability, these transfers must be non-negative[4]

$$\begin{aligned} t_1(y_1) &\geq 0 \\ t_2(y_1, y_2) &\geq 0. \end{aligned}$$

Since only the difference between the payment in case of success and the one after failure matters for the lawyer's incentives, these constraints reduce to

$$t_1(1) \geq 0 \tag{LL1}$$

$$t_2(y_1, 1) \geq 0 \tag{LL2}$$

after setting $t_1(0) = t_2(y_1, 0) = 0$. The contract must also ensure the lawyer's participation. We normalize the lawyer's outside payoffs to zero, and obtain the individual rationality constraints concerning the lawyer's expected payoffs from the litigation in the trial court litigation and the appeals court:

$$L_1 = e_1 a(1) + (1 - e_1) a(0) - c_1(e_1) \geq 0 \tag{IR1}$$

$$L_2 = e_2 t_2(y_1, 1) - c_{2y_1}(e_2) \geq 0 \tag{IR2}$$

where $a(y_1)$ is the lawyer's continuation payoff after a trial court verdict y_1, and can be be written as:

$$a(y_1) = t_1(y_1) + (y_1 q + (1 - y_1))[e_2(y_1) t_2(y_1, 1) - c_{2y_1}(e_2(y_1))] \tag{1}$$

When designing the contract, the plaintiff incorporates how payment schemes influence lawyer's incentives. The lawyer chooses the following levels of effort:

$$e_1 \in \underset{e_1 \in [0,1]}{\operatorname{argmax}} \; L_1 = e_1 a(1) + (1 - e_1) a(0) - c_1(e_1) \tag{2}$$

$$e_2(y_1) \in \underset{e_2 \in [0,1]}{\operatorname{argmax}} \; L_2 = e_2 t_2(y_1, 1) - c_{2y_1}(e_2) \tag{3}$$

[4]This restriction is consistent with the *champerty doctrine* in the U.S. and the forbidden *pactum de cuota litis* in continental Europe.

that result from the first-order conditions

$$a(1) - a(0) = c_1'(e_1) \tag{IC1}$$

$$t_2(y_1, 1) = c_{2y_1}'(e_2(y_1)). \tag{IC2}$$

The level of effort that is privately optimal for the lawyer is attained where the marginal benefit, which is the increase of the probability of obtaining $a(1)$ instead of $a(0)$ in (IC1) and the increase in the probability of obtaining $t_2(y_1, 1)$ instead of $t_2(y_1, 0) = 0$ in (IC2), is equal to the marginal cost. In comparison, the first-best level of appeals court effort, $e_2^{FB}(y_1)$, solves $J = c_{2y_1}'(e_2(y_1))$.
The plaintiff maximizes her expected payoff using the contract terms $\mathcal{C} = \langle t_1(1), t_2(y_1, 1)\rangle$ subject to the lawyer's incentive, participation, and limited liability constraints[5]

$$\max_{\mathcal{C}} e_1[(1-q)J - t_1(1) + qe_2(1)(J - t_2(1,1))] + (1-e_1)e_2(0)(J - t_2(0,1))$$
$$s.t.\ (LL1), (LL2), (IR1), (IR2), (IC1), (IC2)$$

The following intermediary result simplifies this problem.

Lemma 1. *The constraints (LL2), (IR1) and (IR2) are satisfied.*

Proof. See Appendix A □

Given Lemma 1, the plaintiff's maximization problem may be rewritten using the lawyer's first-order conditions as:

$$\max_{e_1, e_2(0), e_2(1)} e_1[(1-q)J - t_1(1) + qe_2(1)(J - c_{21}'(e_2(1)))] + (1-e_1)e_2(0)(J - c_{20}'(e_2(0)))$$
$$s.t.\ t_1(1) = -q[e_2(1)c_{21}'(e_2(1)) - c_{21}(e_2(1))] + a(0) + c_1'(e_1) \geq 0$$

We can now characterize the contract that maximizes the plaintiff's expected payoffs subject to the constraints.

Proposition 1. *The contract optimal for the plaintiff entails:*

(i) effort levels such that $e_1 > 0$, $e_2(0) \in \big(0, e_2^{FB}(0)\big)$, *and* $e_2(1) \in \big(0, e_2^{FB}(1)\big]$;

(ii) transfer payments at the trial stage such that $t_1(0) = 0$ *and*

[5] Remember that $t_1(0) = t_2(y_1, 0) = 0$.

(a) $t_1(1) > 0$ *and* $e_2(1) = e_2^{FB}(1)$ *if* $q < \bar{q}$, *where* $\bar{q} > 0$,

(b) $t_1(1) = 0$ *and* $e_2(1) < e_2^{FB}(1)$ *if* $q \geq \bar{q}$,

(iii) *transfer payments at the appeals stage such that* $t_2(y_1, 0) = 0$ *and for* $t_2(y_1, 1)$*:*

(a) *If* $c_{20}(e_2)\left[1 - \varepsilon_{ce}^{20}\right] < c_{21}(e_2)\left[1 - \varepsilon_{ce}^{21}\right]$ *with* $\varepsilon_{ce}^{2y_1}$ *as the elasticity of costs after an outcome* y_1, *then* $e_2(1) > e_2(0)$*; there exists* $\hat{e} < e_2(1)$ *defined by* $c_{21}'(e_2) = c_{20}'(\hat{e})$ *such that*

* *if* $e_2(0) > \hat{e}$ *then* $t_2(1, 1) < t_2(0, 1)$
* *if* $e_2(0) < \hat{e}$ *then* $t_2(1, 1) > t_2(0, 1)$.

(b) *If* $c_{20}(e_2)\left[1 - \varepsilon_{ce}^{20}\right] > c_{21}(e_2)\left[1 - \varepsilon_{ce}^{21}\right]$ *then the sign of* $t_2(1, 1) - t_2(0, 1)$ *is ambiguous.*

Proof. See Appendix B □

Naturally, the plaintiff induces some effort in the court of first-instance. We also find that the effort in the appeals court may reach the first-best level when the trial court judged in favor of the plaintiff, but not otherwise. The dependency of the appeals court on the trial court's judgment shows in effort levels. The plaintiff may induce lower effort after a defeat in trial court (see part (iii)).

With regard to the transfers after the trial court judgment, the plaintiff incentivizes the lawyer using solely the payment after a success in the appeals court when it is sufficiently likely that the defendant will appeal after a defeat in trial court (*i.e.*, when $q \geq \bar{q}$). If that payment applies, there will be less than first-best lawyer effort in the appeals court, as would be expected in a moral hazard setup.

With regard to the transfers after the appeal court's decision, we find that it is possible that the payment received after a defeat in trial court decision may be higher or lower than the one in which the appeals court trial was due to the defendant's filing of an appeal (*i.e.*, after the plaintiff winning the trial court case). In this context, it must be borne in mind that the absolute and the marginal cost of appeal court effort depend on the trial court's decision. Having $t_2(1, 1) > t_2(0, 1)$ clearly creates additional incentives for trial court effort. However, the cost advantage that is due to $y_1 = 0$ contributes to this objective as well. When the latter effect is very strong, we may thus have that $t_2(0, 1) > t_2(1, 1)$ turns out to be optimal, which contrasts with the result by Ohlendorf and Schmitz (2012).

Proposition 2. *An increase in the likelihood of an appeal by the defendant (i.e. q) implies that:*

(a) $\frac{de_1}{dq} < 0$ *and* $\frac{dt_1(1)}{dq}$ *has an ambiguous sign;*

(b) $\frac{de_2(0)}{dq} > 0$, $\frac{dt_2(0,1)}{dq} > 0$, $\frac{de_2(1)}{dq} \leq 0$, *and* $\frac{dt_2(1,1)}{dq} \leq 0$.

Proof. See Appendix C □

Intuitively, the greater the likelihood that the defendant files for appeal, the lower the induced level of effort in trial court. Winning in trial court is less important because it concludes the case with a lower probability. The lower level of effort in trial court implies that the plaintiff-lawyer pair more often enters the appeals court with a record of $y_1 = 0$ such that it is relatively more important to provide incentives using $t_2(0, 1)$. The fact that this implies some substitution then explains the effects regarding $t_2(1, 1)$ and $e_2(1)$.

4. Conclusion

This paper analyzes how the plaintiff would like to compensate the lawyer when the adjudication process includes the possibility to file an appeal. The plaintiff's problem can be understood as a dynamic moral hazard problem, where the second-instance trial is linked to the first-instance trial as appeals courts are to some extent guided by the trial court's activity. We highlight that the plaintiff focuses incentives on the scenario in which the case is appealed and then decided in favor of the plaintiff. This is due to the fact that incentives provided regarding the appeals stage are also relevant for effort incentives in the trial stage. Interestingly, there are circumstances in which the payment received by the lawyer after the appeal court's judgment is higher after losing in trial court than after winning. This possibility arises because persuading the appeals court implies costs that depend on the trial court outcome. Our aim was to explore lawyer compensation in a simple setup. This paper may thus be considered as a first step, and several extensions should be made to improve our understanding of the various matters that realistically impinge on this issue. For example, as mentioned in the paper, we restrict our attention to a full commitment situation by ruling out the possibility of contract renegotiation after the trial stage and before the potential appeal period. Using, for example, the analyses by Wang (2000) and/or Zhao (2006), it would be obviously relevant to embed the present approach in a more general setup with renegotiation-proof contracts, in order to check the robustness of our results in such an alternative analytical framework. Moreover, in this paper, we focus on the litigation in the trial and the appeals court, ignoring the possibility of settlement bargaining. Clearly, it is interesting to consider the lawyer compensation offered by the plaintiff when there is settlement bargaining before the two levels of court judgments are passed.

Appendix A. Proof of Lemma 1

Using the $t_2(y_1, 1)$ implied by (IC2) in (IR2) yields:

$$L_2(e_2(y_1)) = e_2(y_1)c'_{e_2y_1}(e_2(y_1)) - c_{2y_1}(e_2(y_1))$$

Since $L_2(0) = 0$ and $L'_2(e_2(y_1)) = e_2(y_1)c''_{e_2}(e_2(y_1), y_1) \geq 0$, we get $L_2(e_2(y_1)) \geq 0$ such that (IR2) is satisfied.
Restating (IC1) yields $a(1) = a(0) + c'_1(e_1)$, which allows to state (IR1) as follows:

$$L_1(e_1) = a(0) + e_1c'_1(e_1) - c_1(e_1) \geq 0$$

Since (IR2) is satisfied, we have $a(0) \geq 0$. By noting $f(e_1) = e_1c'_1(e_1) - c_1(e_1)$, we have $f(0) = 0$ and $f'(e_1) = e_1c''_1(e_1) \geq 0$ since $c''_1(e_1) \geq 0$ by assumption. As a result, (IR1) is satisfied.
(LL2) is induced by (IC2) since $c'_{e_2}(e_2(y_1), y_1) \geq 0$.

Appendix B. Proof of Proposition 1

Denote by $x(y_1) = qy_1 + 1 - y_1$ the probability that there will be an appeal as a function of the trial court's judgment. Moreover, define $\pi(a)$ as the plaintiff's maximum continuation payoff when she implements a lawyer continuation payoff a. Using $t_2(y_1, 1) = c'_{2y_1}(e_2(y_1))$, we consider:

$$\begin{aligned} P(e_2(y_1), y_1) &= e_2(y_1)(J - c'_{2y_1}(e_2(y_1))) \\ \text{and } A(e_2(y_1), y_1) &= e_2(y_1)c'_{2y_1}(e_2(y_1)) - c_{2y_1}(e_2(y_1)) \end{aligned}$$

as the expected payoff of the plaintiff and the lawyer, respectively, from an appeal. The expected social surplus is thus given by:

$$S(e_2(y_1), y_1) = e_2(y_1)J - c_{2y_1}(e_2(y_1)).$$

Hereafter, we omit y_1 when the computations are true whatever the value of y_1. Using a restatement of (1), $a = t_1 + xA(e_2)$, the plaintiff's program to determine the optimal continuation payoff $\pi(a)$ may be written:

$$\begin{aligned}&\max_{t_1,e_2} xP(e_2) - t_1\\ &\text{s.t. } \; t_1 = a - xA(e_2) \geq 0\end{aligned}$$

Replacing $t_1 = a - xA(e_2)$ in the plaintiff's objective function, this becomes:

$$\begin{aligned}&\max_{e_2} xS(e_2) - a\\ &\text{s.t. } \; a - xA(e_2) \geq 0\end{aligned}$$

With $\lambda \geq 0$ as the Lagrange multiplier, the Lagrangian is:

$$\mathcal{L} = xS(e_2) - a + \lambda(a - xA(e_2))$$

The first-order conditions are then given by:

$$S'(e_2) - \lambda A'(e_2) = 0 \tag{B.1}$$

$$\lambda(a - xA(e_2)) = 0 \tag{B.2}$$

and allow us to reason about the plaintiff's desired level of appeals court effort as a function of the outcome y_0.

Step 1. Proof of $e_2 \in \left(0, e_2^{FB}\right]$

We first show that $e_2 = 0$ cannot be a solution. We know from the proof of Lemma 1 that $a(0) \geq 0$. From (IC1) (*i.e.* $a(1) - a(0) = c_1'(e_1)$), and $c_1'(e_1) \geq 0$, we deduce that $a(1) \geq a(0)$. Hence, since $a \geq 0$ and $A(0) = 0$, we get $\lambda = 0$ and $S'(0) = 0$, which is impossible since $S'(0) = J$.

Next, we show that any $e_2 > e_2^{FB}$ cannot be a solution. For $e_2 > e_2^{FB}$, we have $S'(e_2) < 0$, which violates (B.1) since $\lambda A'(e_2) \geq 0$.

Step 2. Proof of $e_2(0) \in \left(0, e_2^{FB}(0)\right)$ and $e_2(1) \in \left(0, e_2^{FB}(1)\right]$

We know that $t_1(0) = 0$ is optimal. The plaintiff's program with outcome $y_1 = 0$ is thus:

$$\max_{e_2(0)} P(e_2(0))$$

as x is a constant.

Since $P(e_2^{FB}) = 0$ and $P'(e_2^{FB}) = -e_2^{FB} c''(e_2^{FB}) < 0$, we know that $e_2(0) < e_2^{FB}(0)$.

For the case with outcome $y_1 = 1$ such that $x(1) = q$, we can state the following lemma.

Lemma 2. *For a given lawyer's continuation payoff $a(1)$, we have:*

(i) $e_2(1) = e_2^{FB}(1)$ *and* $t_1(1) = a(1) - qA\left(e_2^{FB}(1)\right) > 0$ *if* $q < \frac{a(1)}{A\left(e_2^{FB}(1)\right)} = \bar{q}$ *;*

(ii) $e_2(1) = A^{-1}\left(\frac{a(1)}{q}\right) < e_2^{FB}(1)$ *and* $t_1(1) = 0$ *if* $q \geq \bar{q}$.

Proof. Consider the first-order conditions (B.1) and (B.2).

If $\lambda = 0$, then $S'(e_2) = 0$ and, thus, $e_2 = e_2^{FB}$, implying $\pi(a, e_2^{FB}) = qS(e_2^{FB}) - a \leq 0$ since $a \geq qA(e_2^{FB}) = qS(e_2^{FB})$. Furthermore, we get $t_1(1) = a(1) - qA\left(e_2^{FB}(1)\right) > 0$.

If $\lambda > 0$ or $t_1(1) = 0$, then the second-best effort e_2 is the solution of $a = qA(e_2)$. We have $\pi(a, e_2) = qP(e_2)$. Since $P(e_2^{FB}) = 0$ and $P'(e_2^{FB}) = -e_2^{FB} c''(e_2^{FB}) < 0$, we get $P(e_2) > P(e_2^{FB}) = 0$ and, thus, $\pi(a, e_2^{*}) > \pi(a, e_2^{FB})$.

Consequently, it is always optimal to make the constraint binding. However, the constraint cannot be bind if the probability that the defendant will appeal is too small, $q < \bar{q}$, since $e_2^{FB}(1) = \sup_{e_2(1) \in \left(0, e_2^{FB}(1)\right]} A(e_2(1))$. □

Step 3. Analysis of the optimal continuation payoff $\pi(a)$.

Consider, first, the case $q \geq \bar{q}$. We know from Step 2 that $e_2 \in \left(0, e_2^{FB}\right)$ and $a = xA(e_2)$. We also know that $a \in (0, xA(e_2^{FB}))$ since $A(e_2)$ is continuous and increasing in e_2 and $A(0) = 0$. Furthermore, the derivative of the function $\pi(a) = xP(e_2) = xP(A^{-1}(a/x))$ is $\pi'(a) = \frac{P'(e_2)}{A'(e_2)}$. When $a \to xA(e_2^{FB})$ (*i.e.* when $e_2 \to e_2^{FB}$), we have:

$$\pi'(a) = \frac{P'(e_2)}{A'(e_2)} \to \frac{P'(e_2^{FB})}{A'(e_2^{FB})} = -1 < 0$$

While, when $a \to 0$ (*i.e.* when $e_2 \to 0$), we get:

$$\pi'(a) \to \frac{P'(0)}{A'(0)} \to +\infty$$

Some algebra gives:

$$\pi''(a) = \frac{P''(e_2)A'(e_2) - P'(e_2)A''(e_2)}{A'(e_2)^2} = \frac{S''(e_2)A'(e_2) - S'(e_2)A''(e_2)}{A'(e_2)^2} < 0$$

implying that $\pi(a)$ is concave. Therefore, the continuation payoff reaches a maximum in the interval $(0, xA(e_2^{FB}))$.

Second, if $q < \bar{q}$, then the continuation payoff is $\pi(a(1)) = qS(e_2^{FB}(1)) - a(1)$.

Step 4. Determination of the second-best effort level at the trial stage.

The plaintiff can choose any pair of non-negative $a(1)$ and $a(0)$ to solve the following maximization problem:

$$\max_{e_1,a(0),a(1)} e_1[(1-q)J + \pi(a(1))] + (1-e_1)\pi(a(0))$$

Replacing $a(1)$ by $a(0) + c_1'(e_1)$ using (IC1), this problem becomes:

$$\max_{e_1,a(0)} e_1[(1-q)J + \pi(a(0) + c_1'(e_1))] + (1-e_1)\pi(a(0))$$

The first-order conditions, which are sufficient since the objective function is concave, are given by:

$$(1-q)J + \pi(a(1)) - \pi(a(0)) + \pi'(a(1))e_1 c_1''(e_1) = 0 \tag{B.3}$$

$$e_1\pi'(a(1)) + (1-e_1)\pi'(a(0)) = 0 \tag{B.4}$$

Consider that $e_1 = 0$. From (IC1), we deduce that $a(1) = a(0)$ since $c'(0) = 0$ by assumption. From (B.4), we get $\pi'(a(0)) = 0 = \pi'(a(1))$ and $\pi(a(1)) = \pi(a(0))$, which violates (B.3). Therefore, the lawyer exerts a positive effort at the trial stage (*i.e.* $e_1 > 0$).

Note that $\overline{q} \equiv \frac{a(1)}{A\left(e_2^{FB}(1)\right)} > 0$ is satisfied since $e_1 > 0$ (implying that $a(1) > 0$).

Step 5. Assessing payments after the appeals court's judgment.

Since $e_1 > 0$, from (IC1) we deduce $a(1) > a(0)$ or $qA(e_2(1), 1) > A(e_2(0), 0) \geq qA(e_2(0), 0)$. Remember $A(e_2, y_1) = e_2 c_{2y_1}'(e_2) - c_{2y_1}(e_2)$. Our assumptions ensure that $A_e'(e, y_1) = e_2 c_{2y_1}''(e_2) \geq 0$ and $A_e''(e, y_1) = c_{2y_1}''(e_2) + e c_{2y_1}'''(e_2) \geq 0$. We have two cases to consider.

Case (a): Suppose that $c_{21}'(e_2) - c_{20}'(e_2) < \frac{c_{21}(e_2) - c_{20}(e_2)}{e_2} < 0 \; \forall e_2 \in (0, e_2^{FB})$, implying $A(e_2(0), 1) < A(e_2(0), 0)$. We must have $A(e_2(1), 1) > A(e_2(0), 0)$ at the optimum, which can be satisfied only for $e_2(1) > e_2(0)$. From (IC2), we know that $t_2(0, 1) = c_{20}'(e_2(0))$ and $t_2(1, 1) = c_{21}'(e_2(1))$. Furthermore, there exists $\hat{e} < e_2(1)$ such that

$c'_{21}(e_2(1)) = c'_{20}(\hat{e})$ since $c'_{21}(e_2) < c'_{20}(e_2)$, $c''_{2y_1}(e_2) \geq 0$ and $e_2(1) > e_2(0)$. We deduce that $t_2(1,1) = c'_{21}(e_2(1)) < t_2(0,1) = c'_{20}(e_2(0))$ if $e_2(0) > \hat{e}$, and $t_2(1,1) > t_2(0,1)$ otherwise.

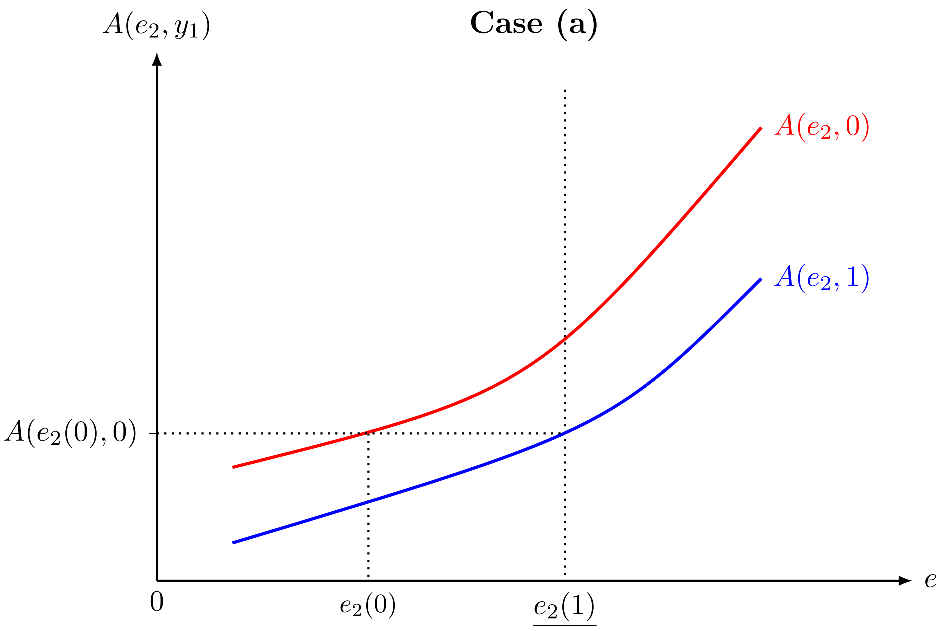

Figure 2: $e_2(1)$ must be greater than $\underline{e_2(1)} > e_2(0)$ to ensure $A(e_2(1), 1) > A(e_2(0), 0)$

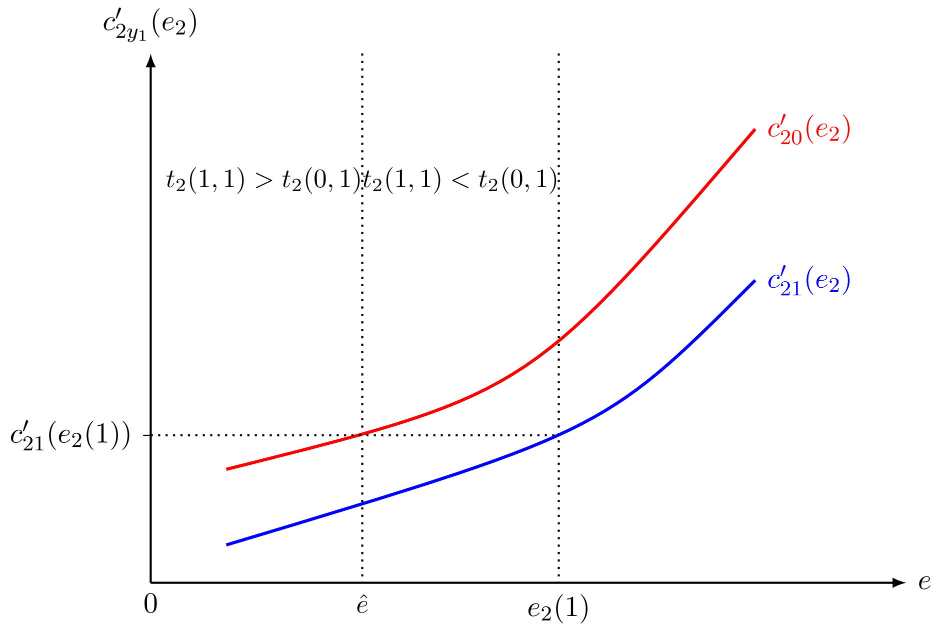

Figure 3:

Case (b): If $\frac{c_{21}(e_2) - c_{20}(e_2)}{e_2} < c'_{21}(e_2) - c'_{20}(e_2) < 0$, then $A(e_2, 1) > A(e_2, 0)$ $\forall e \in$

$(0, e_2^{FB})$ and the signs of both $e_2(1) - e_2(0)$ and $t_2(1,1) - t_2(0,1)$ are ambiguous.

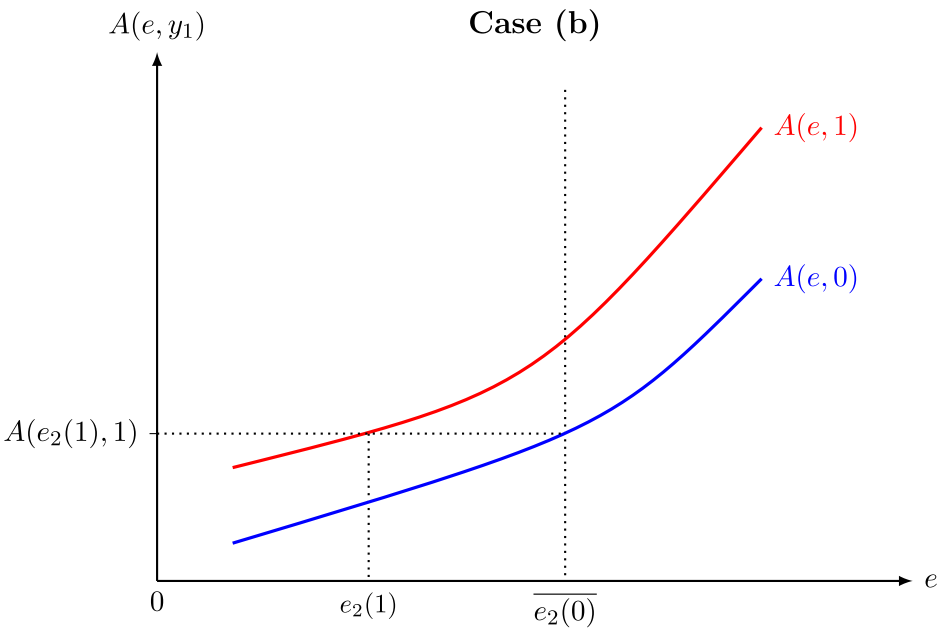

Figure 4: $e_2(0)$ must be smaller than $\overline{e_2(0)} > e_2(1)$ to ensure $A(e_2(1),1) > A(e_2(0),0)$; therefore, we can have $e_2(0) > e_2(1)$ or $e_2(0) < e_2(1)$ as a solution.

Appendix C. Proof of proposition 2

Step 1. Proof of $\frac{de_2(1)}{dq} \leq 0$ and $\frac{dt_2(1,1)}{dq} \leq 0$

Consider, first, the case where $q > \overline{q}$. We know that $t_1(1) = 0$ and, thus, $a(1) = qA(e_2(1), 1)$. For an optimal choice of $a(1)$, we have $\frac{de_2(1)}{dq} = -\frac{a(1)}{q^2 A'(e_2(1),1)} < 0$, since $e_2(1) = A^{-1}\left(\frac{a(1)}{q}\right)$. From (3), we deduce that $\frac{dt_2(1,1)}{dq} < 0$.

Consider now the case where $q \leq \overline{q}$. We have $e_2(1) = e_2^{FB}(1)$, implying that $\frac{de_2(1)}{dq} = \frac{dt_2(1,1)}{dq} = 0$.

Step 2. Proof of $\frac{de_1}{dq} < 0$, $\frac{de_2(0)}{dq} > 0$ and $\frac{dt_2(0,1)}{dq} > 0$

Consider the first-order conditions (B.3) and (B.4), and note for simplicity:

$$E(a(q), e_1(q), q) = (1-q)J + \pi(a(q) + c_1'(e_1(q)) - \pi(a(q)) + \pi'(a(q) + c_1'(e_1(q))e_1(q)c_1''(e_1(q)) = 0$$

and $A(a(q), e_1(q), q) = e_1(q)\pi'(a(q) + c_1'(e_1(q)) + (1 - e(q))\pi'(a(q)) = 0$

By totally differentiating the system, we get:

$$E_a \frac{da}{dq} + E_e \frac{de}{dq} + E_q = 0$$
$$A_a \frac{da}{dq} + A_e \frac{de}{dq} + A_q = 0$$

Given that $A_q = 0$, we get $E_e A_a - (E_a A_e)^2 > 0$, since the program is concave. We deduce that:

$$\text{sign } \frac{de}{dq} = \text{sign } - E_q A_a$$
$$\text{sign } \frac{da}{dq} = \text{sign } E_q A_e$$

where $E_q = -J < 0$, $A_a = e(q)\pi''(a(q) + c_1'(e(q)) + (1 - e(q))\pi''(a(q)) < 0$ and $A_e = \pi'(a(q) + c_1'(e(q)) - \pi'(a(q)) + \pi''(a(q) + c_1'(e(q))e(q)c_1''(e(q)) < 0$ (since, from (B.4), $\pi'(a(q) + c_1'(e(q))$ and $\pi'(a(q))$ have opposite signs, and $\pi(.)$ is concave). Therefore, we get $\frac{de_1}{dq} < 0$.

We also have $\frac{da(0)}{dq} > 0$. We know that $e_2(0) = A^{-1}(a(0))$ and, thus, $\frac{de_2(0)}{dq} = \frac{1}{A'(e_2(0),0)} \frac{da(0)}{dq} > 0$, implying $\frac{dt_2(0,1)}{dq} > 0$.

Step 3. Determination of the effect of q on $t_1(1)$

Only the case where $q < \overline{q}$ matters as $t_1(1) = 0$ otherwise. We know that $t_1(1) = a(1) - qA\left(e_2^{FB}(1)\right)$ and obtain:

$$\frac{dt_1(1)}{dq} = \frac{da(0)}{dq} + c_1''(e_1)\frac{de_1}{dq} - A\left(e_2^{FB}(1)\right)$$

which exhibits an ambiguous sign.

References

At, C. and Gabuthy, Y. (2015). Moral hazard and agency relationship in sequential litigation. *International Review of Law and Economics*, 41, 86–90.

Chambaz, C. (2017). *Les chiffres-clés de la Justice 2017*. Tech. rep., Ministère de la Justice.

Cohen, T. H. (2006). *Appeals from General Civil Trials in 46 Large Counties, 2001-2005*. Tech. rep., Bureau of Justice Statistics.

Dana, J. D. and Spier, K. E. (1993). Expertise and contingent fees: The role of asymmetric information in attorney compensation. *Journal of Law, Economics, & Organization*, 9 (2), 349–367.

Daughety, A. F. and Reinganum, J. F. (2000). Appealing judgments. *RAND Journal of Economics*, 31 (3), 502–525.

Eisenberg, T. and Heise, M. (2015). Plaintiphobia in state courts redux? an empirical study of state court trials on appeal. *Journal of Empirical Legal Studies*, 12 (1), 100–127.

Emons, W. (2006). Playing it safe with low conditional fees versus being insured by high contingent fees. *American Law and Economics Review*, 8 (1), 20–32.

Farmer, A. and Pecorino, P. (2013). Discovery and disclosure with asymmetric information and endogenous expenditure at trial. *Journal of Legal Studies*, 42 (1), 223–247.

Friehe, T. and Wohlschlegel, A. (2017). Rent seeking and bias in appeals systems, Working Papers in Economics & Finance 2017-01, University of Portsmouth.

Hay, B. L. (1997). Optimal contingent fees in a world of settlement. *Journal of Legal Studies*, 26 (1), 259–278.

Iossa, E. and Palumbo, G. (2007). Information provision and monitoring of the decision-maker in the presence of an appeal process. *Journal of Institutional and Theoretical Economics*, 163 (4).

Levy, G. (2005). Careeist judges and the appeals process. *RAND Journal of Economics*, 36 (2), 275–297.

Ohlendorf, S. and Schmitz, P. W. (2012). Repeated moral hazard and contracts with memory: The case of risk-neutrality. *International Economic Review*, 53 (2), 433–452.

Oytana, Y. (2014). The judicial expert in a two-tier hierarchy. *Journal of Institutional and Theoretical Economics*, 170 (3), 537–570.

Shavell, S. (1995). The appeals process as a means of error correction. *Journal of Legal Studies*, 24 (2), 379–426.

— (2006). The appeals process and adjudicator incentives. *Journal of Legal Studies*, 35 (1), 1–29.

Spitzer, M. and Talley, E. (2000). Judicial auditing. *Journal of Legal Studies*, 29 (2), 649–683.

Wang, C. (2000). Renegotiation-proof dynamic contracts with private information. *Review of Economic Dynamics*, 3 (3), 396–422.

White, M. J. (2002). Explaining the flood of asbestos litigation: Consolidation, bifurcation, and bouquet trials, NBER Working Paper Series, Working Paper No. 9362.

Wohlschlegel, A. (2014). The appeals process and incentives to settle, MPRA Paper No. 59424.

Zhao, R. R. (2006). Renegotiation-proof contract in repeated agency. *Journal of Economic Theory*, 131 (1), 263–281.