

# Incentive Structures for Class Action Lawyers

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This article examines the way in which an attorney fee structure that maximizes the expected recovery for class members in a class action may be implemented in practice. Using a mechanism design approach, we demonstrate that if the court can observe the lawyer's effort, then the optimal payoff to the class may be realized using the *lodestar* method—a contingent hourly fee arrangement that is currently practiced in many class actions—but only if the hourly contingent fee is multiplied by a *declining*, as opposed to the practiced *constant*, multiplier. If the court cannot observe the lawyer's effort, then in some circumstances the optimal payoff to the class may still be realized by offering the lawyer a menu of fee schedules from which she has to choose one. Each fee schedule consists of a fixed percentage and a threshold amount below which the lawyer earns no fee, with the threshold increasing with the chosen percentage. The lawyer is paid the fixed percentage chosen only for amounts won above the threshold.

## 1. Introduction

Class actions are private lawsuits in which the represented members of the plaintiff class are absent throughout the litigation, yet are bound by its outcome. It is not uncommon that in a single class action millions of plaintiffs may be represented,<sup>1</sup> hundreds of millions of dollars may be at stake,<sup>2</sup> and whole industries may be at risk of liability.<sup>3</sup> However, it

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1. The Agent Orange class action, for example, involved more than 2.4 million Vietnam War veterans and their family members, who claimed to suffer various injuries as a result of the veterans' exposure to the defoliant Agent Orange while in or near Vietnam. See Schuck (1987) and *Ryan v. Dow Chem.*, 781 F. Supp. 902.

2. For a recent example see *In Re Cendant Corporation Pride Litigation*, 51 F. Supp. 2d 537, a securities class action that was settled for an approximate value of \$340,000,000.

3. The most dramatic example is the asbestos industry, which has been exposed to numerous class actions since the 1970s, resulting in several defendants becoming insolvent. See Hensler et al. (1985) and *Amchem Products v. George Windsor*, 521 U.S. 591.

is the opportunity for private profit, and not the concern for class members' interests, which motivates private attorneys to litigate class actions, invest their time and money, and bear the risk of no compensation if they fail to win a favorable judgment. Class actions thus provide a new paradigm for litigation—the private attorney general paradigm.<sup>4</sup>

Courts have long been struggling with the challenges of managing class actions. Pursuing their own private profit often causes class attorneys to behave in an opportunistic manner, at the expense of the represented class. This tension, between the class action's social goals and the class attorneys' private profit, has generated much concern and debate with respect to the issues of how to select the class attorney, how to monitor her behavior, and how to compensate her.<sup>5</sup> This article addresses the latter issue. It examines the way in which an attorney fee structure that maximizes the expected recovery for class members may be implemented in practice.

Unlike ordinary litigation, where courts do not usually intervene in the litigants' choice of attorney, in their attorney fee arrangements, and in their settlement decisions, in class actions, courts are required to do all of the above<sup>6</sup> in order to secure class members proper compensation given the merit of their case.<sup>7</sup> Although it may seem that the courts' problem in designing optimal fee structures for class attorneys is similar to the one faced by litigants in ordinary litigation, three important features of class actions render this problem more complicated.<sup>8</sup>

First, whereas individual clients may choose to pay their lawyers a noncontingent fee, a class attorney's litigation fee must be contingent on winning the trial. Class members are dispersed and are very costly to identify, especially when the defendant wins an adverse judgment, because no individual class member has an incentive to step forward and identify herself just for the sake of bearing the class attorney's costs. Furthermore, as a matter of law and practice, absent class members are not liable for costs of litigation or attorneys' fees in the event of an adverse judgment against the class, so class attorneys are not compensated unless they create a common fund for the class by winning or settling the lawsuit.<sup>9</sup>

Second, individual clients have strong incentives to take adequate measures to directly monitor their attorneys, which class members and their representatives lack. Most class actions are "lawyer driven" and the class attorney maintains all but absolute control over the lawsuit. She usually initiates the suit, selects the class representative, and controls both the

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4. The term "private attorney general" was first used in *Associated Indus. of New York State, Inf. v. Ickes*, 134 F. 2d 694, 704 (2d Cir. 1943).

5. See "Third Circuit Task Force on the Selection of Class Counsel, Final Report," p. 7 (January 2002).

6. See Federal Rules of Civil Procedure, Rule 23.

7. See, for example, *Brown v. Phillips Petroleum*, 838 F.2d 451, 456 (10th Cir., 1988).

8. See, for example, *Brown v. Phillips Petroleum*, 838 F.2d 451, 456 (10th Cir., 1988) at 7–10.

9. See Newberg and Conte (1992: §8.31, note 338).

litigation process and settlement decisions. The class representative, while supposedly in charge of the litigation as fiduciary for all those similarly situated, is in reality only a token figurehead with no actual control over the lawsuit.<sup>10</sup> Other class members' involvement is even less significant, as they are inclined to free ride on any litigation investment, sharing its proceeds without bearing the associated costs.<sup>11</sup>

Finally, and as we show, most importantly, in ordinary litigation, lawyers "compete" for individual clients and are thus forced to offer optimal fee arrangements given the merits of individual clients' cases, in spite of the fact that the individual clients themselves may not always be aware of all the salient features of their cases. In contrast, in class actions, the choice of attorney is usually made only indirectly. Typically the court chooses the representative class member out of the class members who initiated the lawsuit, and the representative's attorney is then automatically appointed to represent the class. Although such a selection process is instrumental in motivating lawyers to search for worthy causes of action and appropriate class representatives, it nevertheless undermines the competitive forces in the selection of the class attorney. Moreover, the potentially large financial burden of the class action results in a limited and specialized class action bar that further limits the possibility for a real market for class attorneys.

Using a mechanism design approach, we show that if the court can observe the class attorney's effort (the number of hours she spent on the case), then the optimal expected payment to the class may be realized using the *lodestar* method—a contingent hourly fee arrangement that is currently practiced in many class actions—but only if the hourly contingent fee is multiplied by a *declining*, as opposed to the practiced *constant*, multiplier. That is, the optimal contingent fee to the class attorney should be concave in the number of hours worked. We then show that in some circumstances, the same optimal fee structure can be implemented even if the court cannot observe the class attorney's effort, and is therefore forced to use a *percentage* fee. We show that the class attorney can optimally be offered a choice among a schedule of fees, each consisting of a fixed percentage and a threshold amount below which the class attorney earns no fee, with the threshold increasing with the chosen fixed percentage. The class attorney is paid the fixed percentage chosen only for amounts won above the threshold.

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10. See Macey and Miller (1991). In 1995, Congress passed the Private Securities Litigation Reform Act (PSLRA), which included lead plaintiff provisions encouraging institutional investors to become lead plaintiffs in securities class actions and to assume responsibility for selecting lead counsel for the plaintiff class. However, the efficacy of these provisions has been doubtful at best; see, for example, U.S. Securities and Exchange Commission Office of the General Counsel, "Report to the President and the Congress on the First Year of Practice Under the Private Securities Litigation Reform Act of 1995" (April 1997).

11. Although in some class actions, class members may opt out of the class action, their alternative, which is to litigate their claims on their own, is much less promising.

Both fee schedules allow the class attorney to capture a positive rent, over and above her reservation value. This positive rent is a direct consequence both of the court's inability to secure optimal effort by the class attorney (the moral hazard problem) and of the court's lack of information concerning the attorney's ability and the merit of the case (the adverse selection problem). The possible equivalence of the optimal percentage and lodestar methods suggests that the adverse selection problem should be of much concern to courts and regulators when considering how to reform class actions. This finding should be contrasted with the extensive attention given by the literature to lawyers' moral hazard problems, and the scant discussion, if any, devoted to adverse selection issues.

The adverse selection problem would have been much reduced if there had been competition over the position of the class attorney because of the additional information that such competition would have revealed about the appointed attorney's ability and her estimate of the merits of the case. Interestingly, some courts have recently used an auction procedure to select the class attorney in a number of class actions that were initiated under the Federal Securities Litigation Reform Act.<sup>12</sup> However, for reasons that are beyond the scope of this article, this selection procedure has been subject to much scrutiny and has not gained much support. A recent report of a special task force instituted by the Third Circuit, which was convened to evaluate the practice of auctions for class attorney selection, concluded that "the risks and complications associated with a judicially controlled auction counsel against its use except under certain limited circumstances."<sup>13</sup> Our findings suggest that the lack of competition in the selection of the class attorney as it is usually practiced may be of more significance than was appreciated by the Third Circuit task force.

To gain some intuition for our results, suppose first that the court can perfectly observe and monitor the time the class attorney spends on the case, but is not completely informed about either the attorney's ability or the merits of the case. In other words, the court does not know the class attorney's production function—the way in which her effort would affect the expected judgment—which implies that the court faces the problem of determining the level of effort that should be optimally exerted by the attorney.

Clients in ordinary litigation do not usually face such a problem, for two reasons. First, the attorney can be paid her regular hourly fee independent of the outcome of the trial. When paid the reservation value of her time, the attorney is likely to abide by both professional and ethical duties toward her client, and invest optimally in the case. Second, even assuming away professional and ethical considerations, competition among attorneys is likely to drive attorneys' fees toward their respective reservation values, leaving all the surplus to the client.

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12. For a comprehensive review of these cases, see Hooper and Leary (2001).

13. See "Third Circuit Task Force on the Selection of Counsel, Final Report," note 2, p. 18.

In contrast, in class actions, the attorney's compensation must be contingent on winning, and therefore it must be adjusted to account for the risk of nonpayment. The lower the probability of winning, the higher the likelihood of nonpayment, and the higher should be the adjustment of the attorney's fee. In the absence of any competitive forces, the attorney may therefore be tempted to pretend that the probability of not winning is higher than it actually is in order to win a higher adjustment. Such behavior generates inefficiency for two reasons. First, in order to reduce the rent a high-probability attorney can obtain from pretending to have a lower probability of winning, the court has to limit the number of hours paid to low-probability attorneys, thus having them exert less effort than their optimal level in the absence of asymmetric information. Second, this implies that it is impossible to prevent high-probability attorneys from obtaining a positive informational rent.

By prespecifying different levels of effort and adjustments, the court should optimally screen among the different "types" of attorneys in order to have each attorney's investment in the case be as close as possible to the optimal investment, given her information. However, such optimal screening cannot avoid underinvestment of attorney's effort on the one hand, and overpayment to the attorney on the other.

Our main result shows that when the class attorney possesses private information about the probability of winning the class action, the rent that she extracts under the optimal fee schedule may be so large that by using a percentage fee schedule, the same optimal pairs of effort and adjustments can be implemented even if the attorney's effort cannot be observed at all. Intuitively, a percentage fee induces the class attorney to work on the case up to the point where her marginal return equals her per hour cost. Since the attorney's marginal return is increasing in her percentage, so is her choice of effort. We show that to implement the optimal fee schedule, the percentage that is chosen by the attorney must be increasing in her estimated probability of winning. At the same time, to extract at least part of the attorney's informational rent, each percentage must be coupled with a threshold amount below which the attorney earns no fee. We show that optimal screening among attorneys according to their estimated probabilities of winning requires coupling a higher percentage with a higher threshold, which still leaves the attorney an informational rent that increases in her probability of winning. As it turns out, the informational rent of the attorney under this payment scheme need not be higher than the rent she obtains under the optimal fee schedule when her effort is observable.

The rest of the article proceeds as follows. The next section surveys the related literature. Section 3 elaborates further on the fee methods used by courts in class action litigation. In Section 4 we present the general model. In Sections 5 and 6 we apply the general model to the cases of the lodestar and percentage fee methods. The issue of settlement is discussed in Section 7. Concluding remarks are offered in Section 8. All proofs are relegated to the appendix.

## 2. Related Literature

This article is the first to formally analyze the class attorney's adverse selection problem and to characterize an optimal fee menu in this context. Both the literature on client-attorney relationship and the class action literature have, to a large extent, ignored the adverse selection problem. The client-attorney literature has primarily focused on moral hazard problems under the hourly fee and the contingent fee. The problem of securing adequate investment by the lawyer was first discussed by Mitchell and Schwartz (1970) and was further elaborated in Clermont and Curriuan (1978). Danzon (1983) has formally considered the same problem, and Hay (1996, 1997b) has characterized the optimal contingent fee in a simple moral hazard framework. More recently, Polinsky and Rubinfeld (2003) have proposed a modified percentage fee according to which the lawyer would be reimbursed for part of her costs by a third-party administrator (who would be paid in advance), thus equalizing the lawyer's share of the recovery and her share of the costs. None of these articles considers the problem of attorney's private information, except regarding her investment in the case.

The lawyer's private information has been discussed mainly in the narrower context of incentives to bring suits, and in particular in relation to the question of whether contingent fees encourage frivolous litigation (see, e.g., Miceli and Segerson, 1991; Dana and Spier, 1993; and Miceli, 1994).<sup>14</sup> We are aware of only two articles that discuss the optimal fee arrangement for lawyers under asymmetric information in ordinary litigation. Rubinfeld and Scotchmer (1993) analyze several variants of such a model. In the variant that is most closely related to the model presented here, the lawyer's type is unknown to the client. In this case, they show that with perfect competition and zero search costs, in equilibrium, clients pay attorneys a percentage fee plus a fixed, noncontingent sum, and low-ability attorneys are screened out of the market. As search costs increase (which weakens the effect of competition among the attorneys), their result becomes similar to ours in spite of the fact that the lawyer's effort is assumed to be fixed in their model (and hence there is no moral hazard). Namely, in equilibrium, better lawyers choose higher contingent fees and lower fixed fees. Rubinfeld and Scotchmer do not constrain clients to offer attorneys fully contingent fees, which are the only ones practicable in the context of class action, as we do here. More recently, Emons (2000) showed that, in a model where the lawyer has private information about whether the required level of investment in the case is high or low, an hourly fee is preferable to a contingent fee. As mentioned above (and further elaborated below), noncontingent hourly fees are not practicable in class actions.

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14. Private information in litigation and settlement, abstracting from the client attorney agency problems, has been extensively analyzed in the literature. See, for example, Bebchuk (1984), Reinganum and Wilde (1986), and Schweizer (1989).

There is also a distinct body of literature that analyzes the economics of class actions in general, and the class attorney's incentives in particular. None of these articles, however, discusses the problem of optimal lawyer's fees under asymmetric information. Dam (1975) is an early analytic discussion of class actions. Various law review articles discuss agency problems that are particular to the class action context (Coffee, 1983, 1985, 1986, 1987; Macey and Miller, 1991). A somewhat more formal discussion, and an empirical examination of the lodestar and the percentage fee arrangements, can be found in Lynk (1990, 1994). Finally, Hay (1997a, 1997c) discusses how to address the problem of low settlement through appropriate judicial regulation of the class attorney fee in settlement. However, he does not discuss the adverse selection problem nor does he consider the optimal fee in litigation.

The analysis presented in this article relies on methods developed in mechanism design literature, and in particular, the literature that analyzed the problem of the regulation of a monopolist with unknown cost (Laffont and Tirole, 1994, and the references therein). In that context, Laffont and Tirole (1986) observed that a regulator that relies on a menu of linear incentive contracts may achieve optimality without having to monitor the monopolist's effort. This result, which is analogous to our result about the possibility of achieving optimality without monitoring the lawyer's effort, was obtained under the assumption that the regulator's objective function is additively separable in the monopolist's type and effort. Consequently, unlike in this article, in Laffont and Tirole (1986) the optimal effort for the agent under a linear contract is independent of the agent's type, which greatly simplifies the analysis. Initially it appeared that Laffont and Tirole's result could be generalized to other setups, but additional work (Laffont and Tirole, 1994:107–108) showed this not to be the case. Thus the work presented in this article contributes to mechanism design literature by showing that the range of environments where linear incentive contracts that obviate the need for monitoring effort are optimal can be extended to include environments with multiplicatively separable objective functions. Such environments include the interesting case where the agent's type affects its choice of effort under linear contracts.

### 3. Fee Methods Practiced in Class Actions

The analysis of this article is focused on common fund class actions. A common fund class action creates, increases, or preserves, a common fund whose monetary benefits extend to the whole class.<sup>15</sup> The class attorney's fee is paid from the common fund, thus allocating the proceeds from the lawsuit between the class and the lawyer. Since the class is dispersed and class members do not need to actively approve the lawsuit in order to be part of it, the attorney can never collect a fee higher than

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15. For a comprehensive review of the common fund doctrine, see Conte (1993:22–30).

the actual amount recovered. Any noncontingent fee that is paid independently of the suit's outcome is therefore infeasible in this context. For this reason, the two forms of attorney's fees practiced in common fund class actions, the *reasonable percentage fee* and the *lodestar fee*, are both contingent on class victory, and are limited to the amount recovered.

When the court applies the reasonable percentage fee method, it determines the lawyer's compensation as a percentage of the total recovery. However, in setting the reasonable percentage, the court may consider a set of potentially relevant factors, including the time and labor required to litigate the lawsuit, the risk of losing it, the customary lawyer fee in the market, the amount involved in the lawsuit, and the awards in similar cases.<sup>16</sup> If the lodestar fee is employed, the class attorney is paid for the labor and costs she spent on the case. The court determines the hours reasonably expended by counsel, multiplies this number by a reasonable hourly rate, and then adjusts the fee according to the degree of risk involved and the quality of the attorney's work.<sup>17</sup> In contrast to the "output-based" percentage fee method, the lodestar method is "input based."

Underlying both methods is a general standard of reasonableness, by which the class attorney is entitled to a reasonable attorney's fee from the fund as a whole. The choice between the two fee structures is made according to the common practice and precedent in the circuit in which the class action is litigated and the specific context of the suit. Yet anecdotal evidence from courts' opinions as well as empirical research suggest that the two methods end up awarding lawyers with roughly the same dollar amounts (Lynk, 1994). Furthermore, common fund fees in complex class actions normally constitute between 20% and 30% of the class recovery in common funds of up to \$50 million (Conte, 1993:50).

Under both the lodestar and the reasonable percentage fee methods, courts use various techniques when reviewing fee applications to secure accurate reporting of hours. These techniques include auditing and sampling, computerized review of fee submissions, categorized and periodical fee reports, and comparisons with defendants' time records. By using these auditing techniques, courts are able not only to ensure accurate reporting, but also to better monitor the lawyer's investment, minimizing the moral hazard problems inherent in each of the two fee methods. In the absence of such direct monitoring, the lawyer would tend to underinvest in the lawsuit under the reasonable percentage fee, since she bears the full cost of any investment, but obtains only part of its expected return. Under the lodestar fee she would tend to overinvest whenever her rent for each working hour is positive. (Note that if the lawyer's rent for each working hour is negative,

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16. See, for example, *In re Prudential*, 148 F.3d 283,336–340 (3d. Cir. 1998) and most recently *In re Cendant*, 243 F.3d 722 (3d. Cir. 2001).

17. See *Lindy Bros. v. American Radiator & Standard Sanitary Corp.*, 487 F.2d 161 (3d. Cir. 1973).



she would decline to handle the case.) In order to eliminate these moral hazard problems, it is therefore necessary for the court to examine the time the class attorney spent on the case and explicitly regulate it.

#### 4. Model

A court appoints a lawyer to represent a class in a class action. Conditional on winning, the judgment paid to the class is given by

$$j = w(e) + \varepsilon \geq 0,$$

where  $w(e) \geq 0$  describes the way in which the lawyer's effort  $e \geq 0$ , which may be thought of as the number of hours she spends on the case, affects the expected judgment conditional on winning. The additional term  $\varepsilon$  is a random element that expresses the inherent uncertainty associated with the size of the judgment. The function  $w(\cdot)$  is assumed to be increasing, differentiable, and concave. We also assume that  $w(0) \geq 0$ , and  $\lim_{x \nearrow \infty} w'(x) = 0$ . The value of the judgment in case of not winning is assumed to be zero.

The class attorney's expert opinion about the merit of the suit is summarized by her estimate of the probability of winning the case—her type. This probability may reflect either the class attorney's ability or the lawsuit's factual and legal merits, and it is denoted by  $p$ . The expected value of the judgment when a class attorney whose type is  $p$  exerts the effort  $e$  is given by

$$E[p(w(e) + \varepsilon)] = pw(e).$$

Thus, given an effort level  $e$ , the higher the attorney's type, the higher are both the expected judgment and the expected marginal return to effort. Although the functional form assumed implies that the class attorney's effort only affects the court's judgment (conditional on winning), the model can be generalized to allow for the lawyer's effort to also affect the probability of winning the case.<sup>18</sup>

We make the following assumptions about  $j$ ,  $p$ ,  $e$ , and  $\varepsilon$ . The judgment  $j$  is observable and verifiable. It provides the basis for determining the lawyer's fee for handling the class action. The class attorney's type,  $p$ , is known only to herself. We assume that the court, being less knowledgeable about the merits of the case and the class attorney's ability, believes that the class attorney's type  $p \in [0, 1]$  is distributed according to some distribution function  $F$  with density  $f$ . Since we abstract from consideration of the process through which the class attorney was chosen to handle the case, it is assumed that whatever information was revealed about the class attorney through the selection process is already incorporated into the court's

18. Specifically, the lawyer's estimated probability of winning the case may be given more generally by  $p + \pi(e)$ , where  $\pi(e)$  is increasing in the lawyer's effort, differentiable, and such that the function  $\pi(e)w(e)$  is concave in the lawyer's effort. This generalization does not change the qualitative features of our results.

belief,  $F$ . The (unconditional) expected judgment,  $pw(e)$ , is increasing in the effort  $e$  that is exerted by the class attorney. Finally, we assume that the “noise” term,  $\varepsilon$ , has an expectation of zero, conditional on any class attorney’s effort,  $E[\varepsilon|e]=0$ . Note that since any systematic bias in  $\varepsilon$  can be incorporated into the class attorney’s effort or into the function  $w(\cdot)$ , this assumption entails no loss of generality. For our results to hold, certain restrictions need to be imposed on the distribution of  $\varepsilon$ , which may generally depend on the “strategy” employed by the class attorney in conducting the trial. We defer additional discussion of these restrictions to the next two sections.

The class attorney’s payoff from handling the class action is given by

$$t - ce,$$

where  $t$  denotes the payment to the class attorney (the class attorney’s fee), and  $c > 0$  denotes the class attorney’s per-unit cost of effort.<sup>19</sup> We assume that the class attorney is a (risk-neutral) expected utility maximizer. We normalize the class attorney’s opportunity cost to zero.

The payoff to the class is given by

$$j - t,$$

where the judgment is  $j$  and the class attorney is paid  $t$ . We assume that the court designs the incentive scheme for the class attorney trying to maximize the expected payoff to the class subject to the ex post constraint that

$$0 \leq t \leq j. \tag{1}$$

That is, the class attorney cannot be paid more than the realized judgment. She is also subject to a limited liability constraint—she cannot be asked to pay the class out of her own pocket. This latter constraint, although usually satisfied in practice, is not mandated by law and may therefore be relaxed.

To simplify the discussion, we assume first that the class attorney’s effort is observable by the court, so the only private information held by the class attorney concerns her type,  $p$ . We later demonstrate that if the court also faces a moral hazard problem because it cannot observe the class attorney’s effort, then it may nevertheless still obtain the same expected payoff for the class.<sup>20</sup>

For the purpose of characterizing the maximum expected payment to the class, it is helpful to adopt what is known in mechanism design literature as the direct revelation approach. Suppose that upon appointing the class attorney, the court asks her to reveal her type,  $p$ . Depending on the class attorney’s report, which we denote by  $\hat{p}$ , the court determines

19. The analysis can easily be generalized to allow for class attorney’s costs that are convex in effort.

20. Note that the monotonicity of  $w(\cdot)$  implies that without the noise term  $\varepsilon$ , the court can invert the judgment  $j = w(e)$  to determine the lawyer’s effort.

the effort required from the class attorney,  $e(\hat{p})$ , and a fee schedule (that may depend on the class attorney's reported type) that specifies the payment to the class attorney as a function of the realized judgment,  $t_{\hat{p}}(j)$ . The class attorney is not paid anything if she does not win. Equivalently the court may simply reward the class attorney after it renders its judgment according to a fee schedule that depends on the observable effort exerted by the class attorney,  $t_{e(\hat{p})}(j)$ .

By the revelation principle (Myerson, 1985), and the fact that as explained above, the lawyer may only be paid if she wins the case, no loss of generality is involved with restricting our attention to incentive compatible contracts of the form  $\{T(p), e(p)\}_{p \in [0,1]}$ , where the class attorney truthfully reports her type  $p \in [0, 1]$ , is asked to exert effort  $e(p) \geq 0$ , and receives an expected payment conditional on winning the case  $T(p)$ .<sup>21</sup> In the next two sections we show how every menu of contracts of this form can be implemented by the more practical lodestar and percentage fee methods.

Since the class attorney's type  $p$  is not observable to the court, for a menu of contracts  $\{T(p), e(p)\}_{p \in [0,1]}$  to indeed be incentive compatible, it must be that the expected payoff to the class attorney upon truthfully revealing her type is larger or equal to what the class attorney could get by misrepresenting her type. Namely, it must be that

$$pT(p) - ce(p) \geq pT(\hat{p}) - ce(\hat{p}) \quad \forall p, \hat{p} \in [0, 1]. \quad (2)$$

Furthermore, if we assume in addition that the class attorney can guarantee herself a payoff of zero by refusing to handle the case, then we must impose an additional constraint to express the fact that the class attorney must voluntarily agree to the terms of the contract, or

$$pT(p) - ce(p) \geq 0 \quad \forall p \in [0, 1]. \quad (3)$$

Otherwise the class attorney would refuse to handle the case.

The court's problem is to choose a menu of contracts  $\{T(p), e(p)\}_{p \in [0,1]}$  that maximizes the expected net payment to the class,

$$\max_{\{T(p), e(p)\}_{p \in [0,1]}} \int_0^1 p(w(e(p)) - T(p)) dF(p), \quad (4)$$

subject to the constraints of incentive compatibility in Equation (2), voluntary participation in Equation (3), and the ex post constraint in Equation (1). We denote the solution to the court's optimization problem by  $\{T^*(p), e^*(p)\}_{p \in [0,1]}$ . We do not explicitly solve for the optimal contract in this article. Such a solution may be obtained analytically, provided a number

21. Intuitively, if a menu of contracts fails to be incentive compatible, then a lawyer with type  $p$  would report some other type  $p'$ , be asked to exert the effort  $e(p')$ , and receive an expected contingent payment  $T(p')$ . But in this case we may simply redefine  $e(\cdot)$  and  $T(\cdot)$  such that  $e(p) = e(p')$  and  $T(p) = T(p')$ .

of additional assumptions are imposed on the court’s belief,  $F$  [see Klement and Neeman (2003) for details]. Such a solution may also be generally obtained by numerical methods.

The next lemma characterizes incentive compatible direct revelation menus of contracts.

*Lemma 1.* A menu of contracts  $\{T(p), e(p)\}_{p \in [0,1]}$  is incentive compatible if and only if  $e(p)$  and  $T(p)$  are nondecreasing in  $p$ , and

$$pT(p) - ce(p) = \int_0^p T(x) dx + K \tag{5}$$

for every  $p \in [0, 1]$  for some constant  $K$ . In the optimal menu of contracts,  $K = 0$ .

Two important properties of incentive compatible menus of contracts should be noted. First, incentive compatibility requires that both the class attorney’s effort  $e(p)$  and the contingent payment to the class attorney  $T(p)$  be nondecreasing in the class attorney’s type  $p$ . Second, if two different class attorney types choose the same level of effort, then they also receive the same contingent payment (although with a different probability). Thus incentive compatibility, or rather the monotonicity of both  $e(p)$  and  $T(p)$ , imply that the class attorney’s expected payment conditional on winning,  $T(p)$ , can be expressed more naturally as a function of the effort exerted by the class attorney. Letting  $e^{-1}(e) = \inf\{p: e(p) \geq e\}$  denote the inverse function of  $e(\cdot)$ , we may rewrite  $T(p)$  as  $T(e^{-1}(e))$ , where  $e^{-1}(e) = p$ .

To simplify the discussion, we henceforth assume that  $e^*(p)$  is an absolutely continuous function. Because any nondecreasing function can be approximated arbitrarily closely by an absolutely continuous function, this assumption need not entail a great loss of generality.<sup>22</sup>

**5. The Lodestar Fee Arrangement**

We show that the optimal menu of contracts  $\{T^*(p), e^*(p)\}_{p \in [0,1]}$  can be implemented through the lodestar contingent hourly fee arrangement. Define a function  $h^*(e)$  that, conditional on the class attorney winning the case, relates the observed number of class attorney’s hours worked to the payment to the class attorney such that

$$h^*(e) = T^*(e^{*-1}(e)),$$

where  $e^{*-1}(e) = \inf\{p: e^*(p) \geq e\}$  denotes the inverse function of  $e^*(p)$ .

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22. Absolute continuity is the property that characterizes the class of real functions that are equal to the indefinite integrals of their derivatives, that is, for which  $g(x) = \int_a^x g'(\theta) d\theta$  for every  $x$ . It is a stronger property than continuity. See Royden (1988:108) for a definition and (p. 111) for an example of a continuous, monotone, and nondecreasing function that is not absolutely continuous. Proposition 1 below only requires that  $e^*$  be continuous. Proposition 2 requires that  $e^*$  be absolutely continuous.

Under the lodestar fee arrangement, a class attorney who has been observed to exert the effort  $e$  is paid  $h^*(e)$  upon winning the class action. Thus a class attorney whose type is  $p$  will choose to exert the effort  $e^*(p)$  and receive an expected payment conditional on winning of  $h^*(e^*(p)) = T^*(p)$ . If she chooses a different level of effort  $e' = e^*(p') \neq e^*(p)$  for some  $p' \in [0, 1]$ , then her payment upon winning would equal  $T^*(e^{*-1}(e')) = T^*(p')$ , in contradiction to the incentive compatibility of the optimal menu of contracts  $\{T^*(p), e^*(p)\}_{p \in [0, 1]}$ .

Under common practice of the lodestar arrangement, the class attorney's hourly rate is multiplied by a *constant* risk multiplier. The next proposition shows that incentive compatibility requires the setting of a *decreasing* or "sliding" multiplier.

*Proposition 1.* The function  $h^*(e)$  is continuous, nondecreasing, and concave in the class attorney's effort.<sup>23</sup>

The optimal marginal contingent hourly fee,  $h^{*'}(e)$ , is thus decreasing in the number of hours worked. Intuitively, for the first fraction of an hour worked, the class attorney is paid her cost of effort,  $c$ , multiplied by the highest possible risk multiplier,  $1/p_{\min}$ .<sup>24</sup> This multiplier decreases as the class attorney's estimate of the merit of the case increases until it equals one for any hour worked beyond the first-best level of effort of a class attorney whose estimate of the probability of winning is one.

A possible problem with the optimal lodestar method as described in this section is that winning the realized judgment may not be high enough to cover the class attorney's fees. To the extent that  $\varepsilon$  may indeed be negative and large in absolute value, class attorneys must be paid a higher hourly fee in those cases where the realized judgment is high enough so that they still receive an expected payment of  $T^*(p)$  conditional on winning. Proper administration of the optimal fee arrangement would then require the court to be knowledgeable about the distribution of the noise term,  $\varepsilon$ .

## 6. The Percentage Method

In this section we show that it may be possible to implement the optimal menu of contracts  $\{T^*(p), e^*(p)\}_{p \in [0, 1]}$  through a menu of contracts that is linear in the realized judgment, even if the court cannot verify the number of hours the class attorney worked. Such contracts obviate the need to monitor the class attorney's effort, and are therefore less costly to implement compared to the lodestar method.

23. Inspection of the proof of the proposition reveals that it holds for any lodestar fee arrangement,  $h(e) = T(e^{-1}(e))$ , where the pair  $\{T(p), e(p)\}_{p \in [0, 1]}$  is incentive compatible, not just the optimal one.

24. The number  $p_{\min} \geq 0$  denotes the lowest lawyer's type who is still allowed to handle the case.

Consider the following menu of linear contracts: the class attorney is allowed to choose a pair that consists of the marginal fraction she gets out of the realized judgment in case of winning,  $b$ , together with a threshold amount,  $\alpha^*(b)$ , that depends on  $b$ , below which she earns no fee. A class attorney who has chosen the pair  $(b, \alpha^*(b))$  receives a fraction  $b$  of the amount she wins above the threshold  $\alpha^*(b)$ .

As we show below, if  $e^*(p)$  is increasing sufficiently fast in  $p$ , then the menu of contracts  $\{b, \alpha^*(b)\}_{b \in [0,1]}$  can be designed so that it is strategically equivalent to the optimal menu  $\{T^*(p), e^*(p)\}_{p \in [0,1]}$ . By varying  $b$  between zero and one, it is possible to induce a lawyer of type  $p$  to exert any effort between zero and the optimal level of effort if the lawyer's type is known. In particular, it is possible to define  $b^*(p)$  to be the share of realized judgment that induces a class attorney of type  $p$  to voluntarily choose the optimal effort level  $e^*(p)$ . That is, for every  $p \in [0, 1]$ ,  $b^*(p)$  is defined such that  $e^*(p) = \arg \max_{e \geq 0} \{pb^*(p)w(e) - ce\}$ . The concavity of the function  $w(\cdot)$  implies that for  $p$  such that  $e^*(p) > 0$ ,

$$b^*(p) = \frac{c}{pw'(e^*(p))}, \quad (6)$$

and for  $p$  such that  $e^*(p) = 0$ ,  $b^*(p) = 0$ .

Letting  $b^{*-1}(b) = \inf \{p: b^*(p) \geq b\}$  denote the inverse function of  $b^*(\cdot)$ , the threshold  $\alpha^*(b)$  is then defined in such a way as to ensure that a lawyer of type  $p$  who exerts the effort  $e^*(p)$  under a linear contract with slope  $b^*(p)$  receives an expected payment that is equal to  $T^*(p)$  conditional on winning the case. Specifically, the definition of  $b^*(p)$  implies that by choosing the contract  $(b, \alpha^*(b))$ , where  $b = b^*(p)$ , a class attorney whose type is  $p$  is induced to exert the effort  $e^*(p)$  and (assuming that realized judgment  $j$  is greater than or equal to  $w(e^*(p))$ ) receives the expected payment

$$E[b^*(p)(j - \alpha^*(b))] = pE[b^*(p)(j - \alpha^*(b)) | p \text{ wins}].$$

Setting

$$\alpha^*(b) = w(e^*(b^{*-1}(b))) - \frac{T^*(b^{*-1}(b))}{b}$$

implies that the (noncontingent) expected payment above is equal to  $pT^*(p)$ , as required. As we show in Lemma 3 in the appendix, if  $b^*(p)$  is nondecreasing in  $p$ , then the threshold  $\alpha^*(b)$  is nonnegative and nondecreasing in  $b$ .

As shown in the next proposition, if the function  $b^*(p)$  is nondecreasing in  $p$ , then the menu of contingent contracts  $\{b, \alpha^*(b)\}_{b \in [0,1]}$  implements the same outcome as the optimal menu of contracts  $\{T^*(p), e^*(p)\}_{p \in [0,1]}$ .

*Proposition 2.* Suppose that  $b^*(p)$  is nondecreasing in  $p$ . If the noise term  $\varepsilon$  is guaranteed not to be “too small” (negative and large in absolute value), then the menu of contingent contracts  $\{b, \alpha^*(b)\}_{b \in [0,1]}$  induces the same outcome as  $\{T^*(p), e^*(p)\}_{p \in [0,1]}$  and is hence optimal.

Interestingly, in a recent class action against Sotheby's and Christie's,<sup>25</sup> the court auctioned the class attorney position and bidders were required to submit a threshold amount below which they would earn no fee, and their percentage fee for amounts won above the threshold was fixed at 25%, in a similar manner to the fee schedule suggested by Proposition 2. The court's scheme was lacking, however, in two important respects. First, since the bidders' regular hourly rate (or more formally, their reservation value) may differ, such an auction cannot discriminate between low-quality lawyers whose reservation hourly rate is low and high-quality lawyers whose reservation hourly rate is high. Both types of lawyers may submit low threshold bids, the former because she only expects to win with a small probability, and the latter because of her high opportunity costs. Second, the implied menu of fee schedules is such that all schedules have the same slope, which, as suggested by our analysis, implies a lower expected payoff to the class than could be realized under the optimal fee schedule, given the court's updated information concerning the merits of the case and the winning attorney's ability following the auction. As stated in the introduction, this article does not analyze the optimal mechanism for selecting the class attorney, so the possible design of an optimal auction that would implement an optimal fee schedule is left for future research.

The result reported in the proposition requires that  $b^*(p)$  be non-decreasing in  $p$ . Equation (6) implies that  $b^*(p)$  is increasing in  $p$  if and only if  $e^*(p)$  is increasing sufficiently fast.<sup>26</sup> Intuitively, if  $b^*(p)$  is decreasing over some interval, then incentive compatibility would be violated because class attorneys with higher types would prefer the combination of a higher marginal fraction of realized judgment together with the lower threshold associated with lower types. Thus implementation through a menu of linear contracts requires that an additional constraint be added to the court's optimization problem described in Equation (4). To the extent that this constraint may be binding, optimal menus of linear contracts generate a strictly lower expected payoff to the class than the optimal lodestar fee.

We conclude this section with the following three observations: First, because the class attorney's marginal share of the suit,  $b^*(p)$ , is less than or equal to one and the threshold is nonnegative, the class always receives some payment when the class attorney wins the case. Second, in case the realized judgment  $j$  is low, or the noise term  $\varepsilon$  is small (specifically, when  $j < \alpha^*(b)$ ), the class attorney receives no fee. Maintaining the class attorney's incentives requires that in this case the class attorney pays  $b(\alpha^*(b) - j)$  to the class, because otherwise

25. *In re. Auction Houses Antitrust Litigation*, 197 F.R.D. 91 (2000).

26. It can be shown [see Klement and Neeman (2003) for details] that if  $F$  is such that  $f(p)$  decreases at a rate that is slower than  $\frac{1}{p^2}$ , then the optimal effort function  $e^*(p)$  is indeed increasing sufficiently fast.

the class attorney's expected contingent payment would be larger than  $T^*(p)$ . This will not pose any problem if the noise term  $\varepsilon$  is sufficiently large (specifically, such that  $j \geq \alpha^*(b^*(p))$  for every  $p$ ). Another way of overcoming this difficulty is to implement the same incentive scheme with the class attorney making contingent lump sum payments to the class that ensures that her expected payment conditional on winning the case is exactly  $T^*(p)$ . With such a scheme, again when the noise  $\varepsilon$  is small, the class attorney may have to pay the class out of her pocket. However, as mentioned above, the constraint that the class attorney's payment be nonnegative is not mandated by law and may therefore be relaxed.<sup>27</sup> Finally, a "boundedly rational" court may only employ a few contingent contracts, as opposed to the continuum of contingent contracts in the optimal menu of contingent contracts  $\{b, \alpha^*(b)\}_{b \in [0,1]}$ . In a somewhat different context, McAfee (2002) has recently shown that at worst, the welfare loss from using only two contracts is bounded from above by 50%.

## 7. A Note on the Regulation of Settlement

Most class actions settle.<sup>28</sup> When asked to approve a proposed settlement, a court examines whether it is fair and reasonable given its estimate of the case's expected litigation value. The court's task is to ensure that the class would earn at least the net expected payment it would have earned had the case proceeded to trial (see Hay, 1997a, 1997c). This definition of the court's objective implies that the regulation of settlement should be closely related to the class attorney's fee structure in litigation.

Suppose the defendant and the class attorney propose a settlement,  $S$ , for the court's approval.<sup>29</sup> The court can identify the type  $p$  that generates a joint surplus to the class and the class attorney,  $p(w(e^*(p)) - ce^*(p))$ , that is equal to  $S$ , and allocate the settlement  $S$  between the class attorney and the class accordingly, giving  $pT^*(p) - ce^*(p)$  to the class attorney and  $p(w(e^*(p)) - T^*(p))$  to the class.<sup>30</sup> Because under the optimal fee structure both the class attorney's expected payoff and the expected payment to the class are increasing in the class attorney's type  $p$ , and because any type of class

27. Another possibility is to implement the same incentive scheme with a noncontingent lump sum payment (equal to  $p(b^*(p)w(e^*(p)) - T^*(p))$ ). This modification may be preferable because with contingent lump sum payments, a lawyer who realizes that  $\varepsilon$  is likely to be small, so that her share of the eventual judgment may be smaller than the lump sum payment she has to make to the class, may prefer to lose the case.

28. For example, a study of class actions over the years 1992–1994 in four federal district courts found that settlement rates ranged between 53% and 64% (Willing et al., 1996).

29. Under Rule 23(e) of the Federal Rules of Civil Procedure: "A class action shall not be dismissed or compromised without the approval of the court."

30. We assume for simplicity that the lawyer incurs no costs before trial. Adjusting for the case where her discovery costs are positive but independent of the lawyer's type is straightforward.



attorney would be willing to settle if and only if her payoff in settlement is at least as high as her expected payoff in litigation, following this rule ensures that the class would get at least its expected payment in litigation.

## 8. Conclusion

The ongoing debates about the optimal selection procedure of class attorneys and about which fee arrangement best serves class action members' interests—the lodestar or the percentage fee—have mostly focused on the court's moral hazard problem. Assuming that the court's problem is mainly due to its inability to accurately determine the class attorney's investment in the case, commentators as well as courts have considered the issue of under- or overinvestment to be the most crucial problem in client-attorney relations in general, and in class action litigation in particular. This article demonstrated that in some cases the fact that the class attorney may have access to private information concerning her ability and the merit of the case may be of much greater significance. Indeed, our conclusion that the maximal expected payoff to the class may be the same regardless of whether the class attorney's effort can be observed or not implies that the "adverse selection" or "screening" problem faced by the court may be more significant than the moral hazard problem.

Our results support the inclination of many courts to return to the percentage fee method, and make less use of the lodestar method (Hirsch and Sheehy, 1994: 63–67). Our results also show that in order to maximize the expected payment to the class, courts should use fee menus to screen among class attorneys according to their ability and information. If the percentage fee is preferred, then class attorneys should be offered a choice among various combinations of percentages and threshold judgments below which they earn no fee. Class attorneys who prefer a higher share of the class's recovery would have to agree to a higher threshold, which induces a higher effort and a larger investment on their part. If the lodestar fee is used, then courts should use a sliding multiplier with higher hourly rates for the first hours spent on the case and lower rates for additional hours. Finally, our results suggest that the lack of competition in the selection of class attorneys may be more important than was appreciated because it exacerbates the adverse selection problem facing the court. Consequently a procedure that promotes competition, such as an auction, merits greater attention.

One caveat is in order. The model we use here ignores the revelation of information throughout litigation. Taking a more dynamic perspective may raise other concerns that were not addressed here. For example, as an entrepreneur who raises capital through debt contracts has a preference for risky projects, a percentage fee with a fixed threshold may encourage attorneys to employ risky strategies. Such behavior may

prove costly to class members and may weigh heavily against use of the percentage/threshold fee. More research is therefore needed to extend our model to a dynamic setting.

**Appendix**

*Proof of Lemma 1.* Denote the class attorney’s expected utility under the menu of contracts  $\{T(p), e(p)\}_{p \in [0,1]}$  when she reports her type truthfully by  $U(p) = pT(p) - ce(p)$ . Fix some  $p, \hat{p} \in [0, 1], p > \hat{p}$ . Incentive compatibility implies

$$U(p) = pT(p) - ce(p) \geq pT(\hat{p}) - ce(\hat{p})$$

and

$$U(\hat{p}) = \hat{p}T(\hat{p}) - ce(\hat{p}) \geq \hat{p}T(p) - ce(p).$$

It follows that

$$T(\hat{p})(p - \hat{p}) \leq U(p) - U(\hat{p}) \leq T(p)(p - \hat{p}),$$

and because  $p > \hat{p}$ ,

$$T(\hat{p}) \leq \frac{U(p) - U(\hat{p})}{p - \hat{p}} \leq T(p). \tag{7}$$

It follows that  $T(p)$  is nondecreasing in  $p$  and therefore a.e. continuous (and differentiable) (Royden, 1988:100). We show that  $e(p)$  must be nondecreasing. Suppose otherwise that there exist some  $\hat{p} > \hat{p}$ , such that  $e(\hat{p}) < e(\hat{p})$ . It follows that

$$T(\hat{p})p - ce(\hat{p}) < T(\hat{p})p - ce(\hat{p})$$

for every  $p \in [0, 1]$ , and in particular for  $p = \hat{p}$ , which is a contradiction to incentive compatibility.

Taking the limit of Equation (7), as  $\hat{p} \rightarrow p$  we obtain

$$U'(p) = T(p) \quad a.e.$$

from which it follows that<sup>31</sup>

$$U(p) = U(0) + \int_0^p T(x) dx$$

for every  $p \in [0, 1]$ . Equation (5) follows from the fact that  $U(p) = pT(p) - ce(p)$ .

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31. More precisely, for this to follow,  $U(\cdot)$  has to be absolutely continuous (Royden, 1988: 110). Absolute continuity of  $U$  follows from the Lipschitz condition (Royden, 1988:112) which is satisfied because

$$\begin{aligned} |U(p) - U(\hat{p})| &\leq \max\{T(p), T(\hat{p})\}|p - \hat{p}| \\ &\leq T(1)|p - \hat{p}|. \end{aligned}$$

We now prove that any menu of contracts with nondecreasing  $T(\cdot)$  and  $e(\cdot)$ , where  $T(\cdot)$  satisfies Equation (5) is incentive compatible. Given our assumption, incentive compatibility is satisfied if

$$U(p) = pT(p) - ce(p) \geq pT(\hat{p}) - ce(\hat{p}) \quad \forall p, \hat{p} \in [0, 1],$$

if

$$\int_0^p T(x) dx + K \geq T(\hat{p})(p - \hat{p}) + \int_0^{\hat{p}} T(x) dx + K \quad \forall p, \hat{p} \in [0, 1],$$

and if

$$\int_{\hat{p}}^p T(x) dx \geq T(\hat{p})(p - \hat{p}) \quad \forall p, \hat{p} \in [0, 1].$$

It is straightforward to verify that this inequality follows from the assumption that  $T(p)$  is nondecreasing in  $p$ .

Finally, because  $K$  is a constant transfer to the class attorney that is independent of the realization of judgment, optimality requires that it be set as small as possible. The class attorney's voluntary participation constraint of Equation (3) implies that  $K = 0$ . ■

*Proof of Proposition 1.* Recall that  $e^{*-1}(e) = \inf \{p: e^*(p) \geq e\}$  denotes the inverse function of  $e^*(p)$ . By Lemma 1,  $e^{*-1}(e)$  is such that

$$e^{*-1}(e)T^*(e^{*-1}(e)) - ce = \int_0^{e^{*-1}(e)} T^*(x) dx \tag{8}$$

for every  $e \in [e^*(0), e^*(1)]$ . Because, by Lemma 1, both  $e^*(p)$  and  $T^*(p)$  are nondecreasing, so are  $e^{*-1}(e)$  and  $h^*(e)$ . Furthermore, all four functions are differentiable almost everywhere, and by assumption,  $e^*(p)$ ,  $T^*(p)$ , and therefore by Lemma 1 also  $h^*(e) = T^*(e^{*-1}(e))$  are continuous. Differentiation of Equation (8) with respect to  $e$  and rearranging yields

$$T^{*'}(e^{*-1}(e))e^{*-1'}(e) = \frac{c}{e^{*-1}(e)} \tag{9}$$

for almost every  $e \in [e^*(0), e^*(1)]$ .

Differentiating  $h^*(e)$  once yields

$$\begin{aligned} h^{*'}(e) &= T^{*'}(e^{*-1}(e))e^{*-1'}(e) \\ &= \frac{c}{e^{*-1}(e)} \end{aligned}$$

for almost every  $e \in [e^*(0), e^*(1)]$ .

Differentiating  $h^*(e)$  twice yields

$$h^{*''}(e) = -\frac{ce^{*-1'}(e)}{(e^{*-1}(e))^2} \tag{10}$$

for almost every  $e \in [e^*(0), e^*(1)]$ . Because  $e^{*-1}(e)$  is nondecreasing,  $h^{*''}(e) \leq 0$  for almost every  $e \in [e^*(0), e^*(1)]$ . ■

*Proof of Proposition 2.* Because as long as the noise term  $\varepsilon$  is not too small, the expected payment to a class attorney whose type is  $p$  who exerts effort  $e^*(p)$  under the contingent contract  $(b^*(p), \alpha^*(b^*(p)))$  is equal to  $pT^*(p)$ , it is sufficient to show that the menu of linear contracts  $\{b, \alpha^*(b)\}_{b \in [0, 1]}$  is incentive compatible, or that a lawyer of type  $p$  chooses the linear contract with slope  $b = b^*(p)$  and threshold  $\alpha^*(b^*(p))$  (the definition of  $b^*(p)$  implies that such a lawyer would also exert the effort  $e^*(p)$ ). ■

The proof of the proposition relies on the following lemma.

*Lemma 2.* For every  $p, \hat{p}, \hat{\hat{p}} \in [0, 1]$ , a class attorney of type  $p$  prefers to exert the effort  $e^*(\hat{p})$  under the contingent contract  $(b^*(\hat{p}), \alpha^*(b^*(\hat{p})))$  than to exert the effort  $e^*(\hat{\hat{p}})$  under the contingent contract  $(b^*(\hat{\hat{p}}), \alpha^*(b^*(\hat{\hat{p}})))$ .

*Proof.* The lemma is satisfied if and only if

$$E[b^*(\hat{p})(\max\{w(e^*(\hat{p})) + \varepsilon - \alpha^*(b^*(\hat{p})), 0\})] - ce^*(\hat{p}) \geq E[b^*(\hat{\hat{p}})(\max\{w(e^*(\hat{\hat{p}})) + \varepsilon - \alpha^*(b^*(\hat{\hat{p}})), 0\})] - ce^*(\hat{\hat{p}})$$

for every  $p, \hat{p}, \hat{\hat{p}} \in [0, 1]$ , if and only if

$$pT^*(\hat{p}) - ce^*(\hat{p}) \geq p[b^*(\hat{\hat{p}})w(e^*(\hat{p})) - b^*(\hat{\hat{p}})w(e^*(\hat{\hat{p}})) + T^*(\hat{\hat{p}})] - ce^*(\hat{\hat{p}})$$

for every  $p, \hat{p}, \hat{\hat{p}} \in [0, 1]$ , if and only if

$$T^*(\hat{p}) - T^*(\hat{\hat{p}}) \geq b^*(\hat{\hat{p}})(w(e^*(\hat{p})) - w(e^*(\hat{\hat{p}}))), \tag{11}$$

for every  $p, \hat{p}, \hat{\hat{p}} \in [0, 1]$ .

Equation (6) implies that  $b^*(p)w'(e^*(p)) = \frac{c}{p}$  for every  $p \in [0, 1]$ . Multiplying both sides by  $e^{*'}(p)$ , it follows that

$$b^*(p)w'(e^*(p))e^{*'}(p) = \frac{ce^{*'}(p)}{p} \tag{12}$$

for every  $p \in [0, 1]$ . Thus for every  $\hat{p}, \hat{\hat{p}} \in [0, 1]$ ,

$$\int_{\hat{\hat{p}}}^{\hat{p}} \frac{ce^{*'}(p)}{p} dp = \int_{\hat{\hat{p}}}^{\hat{p}} b^*(p)w'(e^*(p))e^{*'}(p) dp.$$

Differentiating Equation (5) with respect to  $p$  and rearranging, it follows that for every  $p \in (0, 1]$ ,

$$T^{*'}(p) = \frac{ce^{*'}(p)}{p}. \tag{13}$$

The absolute continuity of  $e^*(p)$  implies the absolute continuity of  $T^*(p)$ . It therefore follows that if  $\hat{p} > \hat{p}$ , then

$$\begin{aligned} T^*(\hat{p}) - T^*(\hat{p}) &= \int_{\hat{p}}^{\hat{p}} T^{*'}(p) dp \\ &= \int_{\hat{p}}^{\hat{p}} \frac{ce^{*'}(p)}{p} dp \\ &= \int_{\hat{p}}^{\hat{p}} b^*(p)w'(e^*(p))e^{*'}(p) dp \\ &\geq b^*(\hat{p}) \int_{\hat{p}}^{\hat{p}} w'(e^*(p))e^{*'}(p) dp \\ &= b^*(\hat{p})(w(e^*(\hat{p})) - w(e^*(\hat{p}))), \end{aligned}$$

where the inequality follows from the fact that  $b^*(p)$  is nondecreasing in  $p$ . Similarly, if  $\hat{p} < \hat{p}$ , then

$$\begin{aligned} T^*(\hat{p}) - T^*(\hat{p}) &= - \int_{\hat{p}}^{\hat{p}} \frac{ce^{*'}(p)}{p} dp \\ &= - \int_{\hat{p}}^{\hat{p}} b^*(p)w'(e^*(p))e^{*'}(p) dp \\ &\geq -b^*(\hat{p}) \int_{\hat{p}}^{\hat{p}} w'(e^*(p))e^{*'}(p) dp \\ &= b^*(\hat{p}) \int_{\hat{p}}^{\hat{p}} w'(e^*(p))e^{*'}(p) dp \\ &= b^*(\hat{p})(w(e^*(\hat{p})) - w(e^*(\hat{p}))). \quad \blacksquare \end{aligned}$$

To complete the proof of the proposition, suppose that the menu of contracts  $\{b, \alpha^*(b)\}_{b \in [0, 1]}$  is not incentive compatible. It follows that there is a type of class attorney  $p \in [0, 1]$  that prefers to choose the contingent contract  $(b^*(\hat{p}), \alpha^*(b^*(\hat{p})))$ ,  $\hat{p} \neq p$ , and exert the effort  $\hat{e}$  than to choose the contract  $(b^*(p), \alpha^*(b^*(p)))$  and exert the effort  $e^*(p)$ . By the previous lemma, type  $p$  is even better off exerting the effort  $\hat{e} = e^*(\hat{p})$  under the contract  $(b^*(\hat{p}), \alpha^*(b^*(\hat{p})))$ .<sup>32</sup> But this contradicts the incentive compatibility of the menu  $\{T^*(p), e^*(p)\}_{p \in [0, 1]}$  since it implies that a class attorney of type  $p$  prefers to exert the effort  $e^*(\hat{p})$  and receive an expected payment conditional on winning  $T^*(\hat{p})$  than to exert the effort  $e^*(p)$  and receive an expected payment conditional on winning  $T^*(p)$ .

32. For every  $p$ , the lawyer's optimal choice of effort is increasing in  $b$ ; thus if  $\hat{p} < p$ , then  $e^*(\hat{p}) < \hat{e} < e^*(p)$ , and if  $\hat{p} > p$ , then  $e^*(\hat{p}) > \hat{e} > e^*(p)$ . The existence of  $\hat{p}$  follows from the continuity of  $e^*(p)$ .

*Lemma 3.* The threshold  $\alpha^*(b) = w(e^*(b^{*-1}(b))) - \frac{T^*(b^{*-1}(b))}{b}$  is non-negative and nondecreasing in  $p$ .

*Proof.* Note that

$$\begin{aligned} \frac{d}{dp} \left[ w(e^*(p)) - \frac{T^*(p)}{b^*(p)} \right] &= w'(e^*(p))e^{*'}(p) - \frac{b^*(p)T^{*'}(p) - T^*(p)b^{*'}(p)}{(b^*(p))^2} \\ &\geq w'(e^*(p))e^{*'}(p) - \frac{ce^{*'}(p)}{pb^*(p)} \\ &\geq 0, \end{aligned}$$

where the first inequality follows from Equation (13) and the second from Equation (12). Nonnegativity of  $\alpha^*(b)$  follows from the fact that  $\lim_{b \searrow 0} b^{*-1}(b) = 0$  implies that

$$\lim_{b \searrow 0} w(e^*(b^{*-1}(b))) - T^*(b^{*-1}(b)) = 0. \quad \blacksquare$$

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