Attorneys' Compensation in Litigation with Bilateral Delegation

by

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Abstract
We study litigation between a plaintiff and a defendant in which each litigant hires an attorney who expends his effort on her behalf, and the attorneys' effort is not verifiable to a third party. We examine the equilibrium fixed fees and contingent fees for the attorneys in two legal systems: the system with the nonnegative-fixed-fee constraint and the system with the contingent-fee cap. We show that the fixed fees are always zero in the former legal system, and the contingent fees are always equal to the cap in the latter legal system. We examine also the equilibrium expected payoffs for the attorneys and those for the litigants in the two systems. By comparing these expected payoffs, we show that the attorneys prefer the system with the nonnegative-fixed-fee constraint, while the litigants prefer the system with the contingent-fee cap.

Keywords: Fixed fee; Contingent fee; Litigation; Contest; Delegation

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1. INTRODUCTION

The compensation structure which comprises a fixed fee and a contingent fee, is the standard form of contract between clients and attorneys in personal injury and medical malpractice litigation in the United States.\(^1\) A fixed fee for an attorney is the fee which is paid to him regardless of the outcome of the lawsuit, and his contingent fee is the fee which is paid to him only if he wins the lawsuit. A contingent fee is set as a fixed *percentage or fraction* of the client's recovery. This compensation structure is attractive to clients because it gives them little financial risk of participating in a lawsuit, allows them to overcome the liquidity or wealth constraint problem, reduces agency problems between clients and attorneys, and deals with asymmetries of information between clients and attorneys. Indeed, when attorneys' effort may be observable to clients but is not verifiable to a third party, so that attorneys are subject to moral hazard, the compensation structure alleviates the moral hazard of attorneys by aligning their interests to those of clients.

The purpose of this paper is to systematically study litigation between a plaintiff and a defendant – in which each litigant hires an attorney who expends his effort on her behalf, and the attorneys' effort is not verifiable to a third party – focusing on the equilibrium fixed fees and contingent fees for the attorneys. The novelties of this paper are twofold. First, unlike the previous papers, we model the litigation as the two-player contest with bilateral delegation.\(^2\) Second, we compare two legal systems in terms of the equilibrium fixed fees and contingent fees for the attorneys, the attorneys' equilibrium expected payoffs, and the litigants' equilibrium expected payoffs.

A contest is defined as a situation in which players compete with one another by expending irreversible effort to win a prize. Litigation fits this definition very well. In litigation, a plaintiff and a defendant compete against each other; the plaintiff side and the defendant side expend irreversible litigation effort which influences the outcome of the lawsuit; the winner wins a prize, which is equal to her valuation for winning the lawsuit. This indicates that we can consider litigation as a contest. Among others, an important advantage we get by modeling
litigation as a contest is that it allows us to look at the strategic interactions between the two sides — the plaintiff and her attorney in one side, and the defendant and her attorney in the other side — especially in terms of the attorneys' compensation schemes.

The basic model consists of the following. The litigants are risk-neutral and have the same valuation for winning the lawsuit. They bear their own legal costs regardless of the outcome of the lawsuit. The attorneys are risk-neutral. They have the same nonnegative reservation wage and equal ability for the lawsuit. We set up the following two-stage game. In the first stage, each litigant hires an attorney and writes a contract with him. The contract specifies how much the attorney will be paid if he wins the lawsuit and how much if he loses it — and thus it sets the attorney's fixed fee and his contingent fee. The contract satisfies the attorney's participation constraint based on the reservation wage. Then the litigants simultaneously announce the contracts written independently. In the second stage, after knowing both contracts, the attorneys choose their effort levels simultaneously and independently. At the end of the second stage, the winner is determined and each litigant pays compensation to her attorney according to the contract written in the first stage.

We examine the equilibrium fixed fees and contingent fees for the attorneys in two legal systems: the system with the nonnegative-fixed-fee constraint and the system with the contingent-fee cap. We examine also the attorneys' effort levels, their expected payoffs, and the litigants' expected payoffs in equilibrium. The first legal system is defined as the basic model plus the constraint that fixed fees should be nonnegative. The second legal system is defined as the basic model plus the exogenously given cap on contingent fees.

In the case of the legal system with the nonnegative-fixed-fee constraint, we show that each litigant chooses zero fixed fees for her attorney regardless of the size of the reservation wage. We explain this as follows. By choosing zero fixed fees, each litigant makes her attorney's contingent fee as high as possible, so that she most strongly motivates her attorney to win the lawsuit. Another interesting result is that, when the reservation wage is low, each attorney's equilibrium expected payoff is greater than the reservation wage, meaning that he is
"paid" more than what he should be paid. This gap—between the attorney's equilibrium expected payoff and the reservation wage—is the economic rent for the attorney. This economic rent is not created because of restrictions on entry into the "attorney market," but created because of the litigants' strategic decisions on their attorneys' compensation. Indeed, competing against the other litigant, each litigant needs to "overcompensate" her attorney in order to motivate him to work harder.

Is the nonnegative-fixed-fee constraint an historical accident that has become locked-in in the legal profession? Is it simply an ethical restriction? Is it an optimal response to the conditions of the legal market? Is it used as an anticompetitive device by members of the legal profession? Though these are interesting questions, in this paper, we provide an answer to only the last question, arguing that the constraint is used as an anticompetitive device. If attorneys' effort is not verifiable to a third party, which implies the inability to write contracts based on that effort, then the nonnegative-fixed-fee constraint creates economic rents for attorneys when the reservation wage is low. As discussed in detail below, Santore and Viard (2001) also show that if attorneys' effort is unobservable, the constraint creates rents for attorneys whenever the fixed costs of litigation are small, and argue that the constraint can be understood as a means of maintaining attorneys' rents.

Next, in the case of the legal system with the contingent-fee cap, we show the following results. First, attorneys' equilibrium fixed fees are negative, zero, or positive—depending on the size of both the reservation wage and the contingent-fee cap—and their equilibrium contingent fees are always equal to the cap, regardless of the size of the reservation wage or the contingent-fee cap. Second, the equilibrium expected payoffs for the attorneys are always equal to the reservation wage. Finally, other things being equal, as the contingent-fee cap increases, each litigant's equilibrium expected payoff decreases while the attorneys' equilibrium expected payoffs remain unchanged.

In the opening paragraph, we state the benefits of contingent-fee compensation. On the other hand, there are criticisms of such compensation. Critics of contingent-fee contracts
frequently claim that such contracts encourage frivolous litigation and generate too much litigation; they often generate fees for attorneys that are unwarrantedly excessive; and such contracts place attorneys in conflict with their clients when they consider a possible settlement. In fact, these concerns have provided justifications for imposing upper limits on contingent fees in many states in the United States. This paper may not contribute much to debates over the concerns. However, we show that the economic rents for the attorneys never exist in the legal system with the contingent-fee cap. We show also that lowering the contingent-fee cap causes the attorneys' equilibrium contingent fees to decrease but their fixed fees to increase; it benefits the litigants while leaving the attorneys' welfare intact.

Finally, by comparing the attorneys' equilibrium expected payoffs in the two legal systems, we argue that the attorneys prefer the system with the nonnegative-fixed-fee constraint to the system with the contingent-fee cap. In addition, by comparing the litigants' equilibrium expected payoffs in the two systems, we show that the litigants prefer the system with the contingent-fee cap.

The paper proceeds as follows. Section 2 develops the basic model, and sets up and solves the two-stage game. In Section 3, we consider the legal system with the nonnegative-fixed-fee constraint. In Section 4, we consider the legal system with the contingent-fee cap. Section 5 compares the two legal systems in several respects, highlighting their differences and similarities. Section 6 discusses modifications of the models. Finally, Section 7 offers our conclusions.

1.1. Related Literature

Many scholars have studied compensation for attorneys or related issues in different contexts. Examples include Danzon (1983), Dana and Spier (1993), Gravelle and Waterson (1993), Rubinfeld and Scotchmer (1993), Miceli (1994), Hay (1996, 1997), Emons (2000), Santore and Viard (2001), Choi (2003), and McKee et al. (2007). What are the equilibrium or optimal fee arrangements for attorneys? Do contingent fees promote excessive litigation? Are
attorneys paid more than what they should be paid? Addressing these important questions, they obtain many interesting results. For example, Rubinfeld and Scotchmer (1993) show that a client with a high-quality case signals that her case is high quality by her willingness to pay a relatively high fixed fee and a relatively low contingency percentage, and show also that a high-quality attorney signals his quality by his willingness to take a relatively low fixed fee and a relatively high contingency percentage. Dana and Spier (1993) show that the equilibrium wage contract is upward sloping and linear in the award, and that attorneys earn positive ex post rents in equilibrium. Miceli (1994) shows that contingent fees do not promote excessive litigation.

Santore and Viard (2001) is closely related to this paper. They look at compensation for plaintiffs' attorneys. In their paper, the plaintiff cannot observe her attorney's effort, and the compensation structure for the attorney comprises a fixed fee and a contingent fee. Santore and Viard show that with the nonnegative-fixed-fee constraint, the plaintiff's optimal choice of the fixed fee is 0. They show also that if fixed costs are sufficiently small, the nonnegative-fixed-fee constraint can create economic rents for attorneys. There are similarities and differences between their paper and this one. First, Santore and Viard look at only one side in litigation – the plaintiff and her attorney – while we look at both sides in litigation and their strategic interactions. Second, fixed costs in their paper play a role similar to the reservation wage in this paper. Third, in both papers, without the nonnegative-fixed-fee constraint, the economic rents for the attorneys would not exist. Finally, in both papers, attorneys' entry into the market does not affect the equilibrium contracts.

Farmer and Pecorino (1999) and Hirshleifer and Osborne (2001) model litigation as contests, and address important issues in law and economics. However, neither of the papers considers delegation by attorneys. Farmer and Pecorino consider three-stage games in which the plaintiff and the defendant sequentially decides whether or not to "participate" in the lawsuit, and then they compete by expending irreversible effort to win the lawsuit. They examine the relationship between case quality, legal expenditure, and legal technology, under both the American rule and the English rule. Hirshleifer and Osborne first propose the litigation success
function which satisfies desirable features that a satisfactory litigation success function should display. Then, using the litigation success function, they set up the simultaneous-move game and the sequential-move game with the plaintiff as the leader, and examine the litigation efforts, proportionate success, and values of the lawsuit on each side, in the two games.

2. THE BASIC MODEL

Consider a lawsuit between a plaintiff and a defendant. For concise exposition, let us call the plaintiff litigant 1 and the defendant litigant 2. If litigant 1 wins the lawsuit, she receives \( v \) dollars from litigant 2. If litigant 2 wins the lawsuit, no money changes hands. Since the litigants' valuation for winning the lawsuit is \( v \) dollars, this litigation can be modeled as the contest in which the two litigants each want to win the prize of \( v \) dollars.\(^7\) The litigants are risk-neutral, and bear their own legal costs, regardless of the outcome of the lawsuit.

Each litigant hires an attorney who expends his effort to win the lawsuit on her behalf. Each attorney's effort may be observable to his client, but is not verifiable to a third party. This implies that contracts contingent on an attorney's effort are precluded. Each litigant designs her attorney's compensation scheme: Litigant \( i \) chooses \( W_i \) and \( L_i \). Compensation of \( W_i \) is paid to attorney \( i \) if he wins the lawsuit, and \( L_i \) if he loses it. Let \( W_i = \alpha_i v \) and let \( L_i = \beta_i v \), where \( 0 < \alpha_i < 1 \) and \( \alpha_i > \beta_i \). Then, since \( v \) is exogenously given, litigant \( i \) designs her attorney's compensation scheme by choosing the values of \( \alpha_i \) and \( \beta_i \). In this compensation structure, \( \beta_i v \) represents attorney \( i \)'s fixed fee which is paid to him regardless of the outcome of the lawsuit, while \( (\alpha_i - \beta_i)v \) is attorney \( i \)'s contingent fee which is paid only if he wins the lawsuit.

The attorneys are risk-neutral and have a common reservation wage of \( R \), where \( R \) is nonnegative and is much less than \( v \). Hence, if attorney \( i \) signs up for litigant \( i \), his expected payoff must be greater than or equal to the reservation wage, given the compensation scheme designed by litigant \( i \). If his expected payoff falls short of the reservation wage, attorney \( i \) prefers not to work for litigant \( i \) and accepts alternative employment instead.
We formally consider the following two-stage game. In the first stage, each litigant hires an attorney and writes a contract with him — in other words, litigant $i$ designs and offers attorney $i$ a compensation scheme which attorney $i$ accepts. The contract specifies how much the attorney will be paid if he wins the lawsuit and how much if he loses it. Then the litigants simultaneously announce the contracts written independently — that is, litigant 1 announces publicly the values of $\alpha_1$ and $\beta_1$, and litigant 2 announces publicly the values of $\alpha_2$ and $\beta_2$. In the second stage, after knowing both contracts, the attorneys choose their effort levels simultaneously and independently. At the end of the second stage, the winner is determined and each litigant pays compensation to her attorney according to the contract written in the first stage.

In the second stage of the game, the attorneys compete with each other by expending irreversible effort to win the lawsuit. Let $x_i$ represent the effort level expended by attorney $i$. Effort levels are nonnegative and are measured in monetary units. Let $p_1(x_1, x_2)$ denote the probability that attorney 1 wins the lawsuit when the attorneys' effort levels are $x_1$ and $x_2$. The litigation success function for attorney 1 is given by:

$$p_1(x_1, x_2) = \begin{cases} x_1/(x_1 + x_2) & \text{for } x_1 + x_2 > 0 \\ 1/2 & \text{for } x_1 + x_2 = 0. \end{cases} \tag{1}$$

This function implies that the attorneys have equal ability for the litigation, and that neither of the litigants is favored by the objective merits of the case, in the sense that $p_1(a, b) = 1 - p_1(b, a)$, where $a$ and $b$ are effort levels. Note that $1 - p_1(b, a)$ is the probability that attorney 2 wins the lawsuit when attorney 1 expends $b$ and attorney 2 expends $a$. Function (1) has the following properties: $\partial p_1/\partial x_1 > 0$ and $\partial^2 p_1/\partial x_1^2 < 0$ when $x_2 > 0$, and $\partial p_1/\partial x_2 < 0$ and $\partial^2 p_1/\partial x_2^2 > 0$ when $x_1 > 0$. This says that, given the rival attorney's effort level, each attorney's probability of winning is increasing in his own effort level at a decreasing rate. It says also that, given his effort level, each attorney's probability of winning is decreasing in the rival attorney's effort level at a decreasing rate. Let $\pi_i$ represent the expected payoff for attorney $i$. Then the payoff function for attorney 1 is
Similarly, the payoff function for attorney 2 is

\[ \pi_2 = \alpha_2 v - (\alpha_2 - \beta_2)vp_1(x_1, x_2) - x_2. \] (3)

Next, consider the litigants' expected payoffs computed in the first stage of the game – when litigant \( i \) believes that attorney 1 will expend an effort level of \( x_1 \) and attorney 2 will expend an effort level of \( x_2 \) in the second stage. Given litigant \( i \)'s contract, \((W_i, L_i)\), if her attorney wins the lawsuit in the second stage, litigant \( i \)'s net payoff will be \( v - W_i \); otherwise, litigant \( i \) will gain nothing, but should pay \( L_i \) to her attorney. Let \( G_i \) represent the expected payoff for litigant \( i \). Then the payoff function for litigant 1 is

\[ G_1 = (v - W_1)p_1(x_1, x_2) + (L_1)(1 - p_1(x_1, x_2)) \] (4)

\[ = -\beta_1 v + (1 - \alpha_1 + \beta_1)vp_1(x_1, x_2). \]

Similarly, the payoff function for litigant 2 is

\[ G_2 = (1 - \alpha_2)v - (1 - \alpha_2 + \beta_2)vp_1(x_1, x_2). \] (5)

Finally, we assume that all of the above is common knowledge among the litigants and attorneys. We employ subgame-perfect equilibrium as the solution concept.

2.1. The Second Stage of the Game

To solve for a subgame-perfect equilibrium of the game, we work backward. We begin by considering the second stage in which, after knowing the contracts chosen in the first stage, \((\alpha_1, \beta_1)\) and \((\alpha_2, \beta_2)\), attorney \( i \) seeks to maximize his expected payoff over his effort level, given the other attorney's effort level. Given a positive effort level of attorney 2, the first-order condition for maximizing attorney 1's expected payoff, \( \pi_1 \), yields
Given a positive effort level of attorney 1, the first-order condition for maximizing attorney 2's expected payoff, $\pi_2$, yields
\[
-(\alpha_2 - \beta_2)v(\partial p_1(x_1, x_2)/\partial x_1) = 1.9
\]

Attorney $i$'s payoff function is strictly concave in his effort level. Thus the second-order condition for maximizing $\pi_i$ is satisfied, and attorney $i$'s best response is unique.

We obtain a unique Nash equilibrium of the second-stage subgame using the attorneys' reaction functions, which are derived from conditions (6) and (7). Let $(x_1^N, x_2^N)$ denote the Nash equilibrium.

**Lemma 1.** At the Nash equilibrium of the second-stage subgame, the effort levels of the attorneys are
\[
x_1^N = (\alpha_1 - \beta_1)^2(\alpha_2 - \beta_2)v/\{(\alpha_1 - \beta_1) + (\alpha_2 - \beta_2)\}^2
\]
and
\[
x_2^N = (\alpha_1 - \beta_1)(\alpha_2 - \beta_2)^2v/\{(\alpha_1 - \beta_1) + (\alpha_2 - \beta_2)\}^2.
\]

2.2. The First Stage of the Game

Consider now the first stage in which the litigants choose their contracts, $(\alpha_1, \beta_1)$ and $(\alpha_2, \beta_2)$, simultaneously and independently. The litigants have perfect foresight about the second-stage competition—more specifically, the Nash equilibrium of each second-stage subgame. Let $p_1(x_1^N, x_2^N)$ be the probability that attorney 1 wins the lawsuit at the Nash equilibrium of the second-stage subgame, given contracts, $(\alpha_1, \beta_1)$ and $(\alpha_2, \beta_2)$. Then, using payoff functions (4) and (5), we obtain the litigants' payoff functions which take into account the Nash equilibrium of the second-stage subgame:

\[
G_1^N = -\beta_1 v + (1 - \alpha_1 + \beta_1)v p_1(x_1^N, x_2^N)
\]
and
\[
G_2^N = (1 - \alpha_2)v - (1 - \alpha_2 + \beta_2)v p_1(x_1^N, x_2^N),
\]
where \( p_1(x_1^N, x_2^N) = (\alpha_1 - \beta_1)/\{(\alpha_1 - \beta_1) + (\alpha_2 - \beta_2)\} \), which are obtained using function (1) and Lemma 1.

When choosing a contract for her attorney, each litigant should consider her attorney's participation constraint. Having perfect foresight about the Nash equilibrium of each second-stage subgame, the litigants and attorneys can compute, in the first stage, the attorneys' expected payoffs.

Using payoff functions (2) and (3), we obtain the attorneys' payoff functions which are associated with the Nash equilibrium of the second-stage subgame, given contracts, \((\alpha_1, \beta_1)\) and \((\alpha_2, \beta_2)\):

\[
\begin{align*}
\pi_1^N &= \beta_1 v + (\alpha_1 - \beta_1)v p_1(x_1^N, x_2^N) - x_1^N \\
\pi_2^N &= \alpha_2 v - (\alpha_2 - \beta_2)v p_1(x_1^N, x_2^N) - x_2^N.
\end{align*}
\]

Attorney \( i \)'s participation constraint is then \( \pi_i^N \geq R \).

Now litigant \( i \) faces the following constrained-maximization problem:

\[
\begin{align*}
\text{Max}_{\alpha_i, \beta_i} & \quad G_i^N \\
\text{subject to } & \quad \pi_i^N \geq R.
\end{align*}
\]

That is, taking the opponent's contract as given, litigant \( i \) seeks to maximize her expected payoff over \((\alpha_i, \beta_i)\), subject to her attorney's participation constraint. By doing so, she obtains her best response to the given contract of her opponent. To solve for each litigant's best response in an informative way, we will break up the constrained-maximization problem into two pieces. First, we will look at the problem of how to maximize each litigant's expected payoff without considering her attorney's participation constraint. Then, we will look at the problem of how to choose each litigant's best response while considering her attorney's participation constraint.10
2.2.1. The Unconstrained-Maximization Problem

Maximizing litigant $i$'s expected payoff without considering her attorney's participation constraint, we obtain Lemma 2.

**Lemma 2.** (a) Given litigant $j$'s contract, $(\alpha_j, \beta_j)$, and given $\alpha_i$, litigant $i$'s expected payoff is always decreasing in $\beta_i$: In terms of the symbols, we have $\partial G_i^N / \partial \beta_i < 0$. (b) Given litigant $j$'s contract, $(\alpha_j, \beta_j)$, and given $\beta_i$, litigant $i$'s expected payoff is maximized at $\alpha_i = \beta_i + k_i$, where

\[ k_i = - (\alpha_j - \beta_j) + \{(\alpha_j - \beta_j)^2 + (\alpha_j - \beta_j)\}^{0.5}. \]

The proof of Lemma 2 is provided in Appendix A. Part (a) says that, for any given $\alpha_i$, litigant $i$'s expected payoff increases as $\beta_i$ decreases. This can be explained as follows. As $\beta_i$ decreases, attorney $i$'s contingent fee increases. A larger contingent fee, in turn, gives attorney $i$ more incentives to win the lawsuit and makes him exert more effort. A higher effort level of attorney $i$ then yields a higher probability that attorney $i$ wins the lawsuit in second-stage equilibrium. Therefore, a higher probability of winning and less compensation to attorney $i$ in the case of losing lead to an increase in litigant $i$'s expected payoff.

In part (b), $k_i$ is determined only by the given contract of litigant $j$ and is independent of the litigants' valuation for winning the lawsuit, $\nu$, and the reservation wage, $R$. Thus, in the $\beta_i\alpha_i$-space of Figure 1, the graph of $\alpha_i = \beta_i + k_i$ is a straight line with a vertical intercept of $k_i$ and a slope of unity. Why is there the linear relationship between $\alpha_i$ and $\beta_i$? It is only attorneys' contingent fees that determine their effort levels in second-stage equilibrium (see Lemma 1). As a result, given litigant $j$’s contract, $(\alpha_j, \beta_j)$, there is a unique contingent fee for attorney $i$ that maximizes litigant $i$'s expected payoff, $G_i^N$ (see equation (A1) in Appendix A). This implies that the difference between $\alpha_i$ and $\beta_i$ remains unchanged as $\beta_i$ changes.
2.2.2. The Constrained-Maximization Problem

Consider first attorney $i$’s participation constraint whose weak-inequality sign is replaced by the equals sign. That is, consider $\pi_i^N = R$, which is rewritten as

\[(\alpha_i - \beta_i)^3 v = (R - \beta_i v)\{(\alpha_i - \beta_i) + (\alpha_j - \beta_j)\}^2.\]  

(11)

Figure 1 illustrates its graph. Let us call it attorney $i$’s participation constraint curve. Since $R$ is constant, we have $(\partial \pi_i^N / \partial \alpha_i)d\alpha_i + (\partial \pi_i^N / \partial \beta_i)d\beta_i = 0$ along the curve. This equation yields

\[d\alpha_i/d\beta_i = -(\alpha_j - \beta_j)^2 \{3(\alpha_i - \beta_i) + (\alpha_j - \beta_j)\}/(\alpha_i - \beta_i)^2 \{\alpha_i - \beta_i\} + 3(\alpha_j - \beta_j)\}.\]  

(12)

It is immediate from expression (12) that $d\alpha_i/d\beta_i$ is negative, which means that attorney $i$’s participation constraint curve slopes downward from left to right in the $\beta_i, \alpha_i$-space. The curve meets the 45° line when $\beta_i = \alpha_i = R/v$, and has a vertical intercept of $m_i$, where $m_i$ satisfies

\[m_i^3 v = R\{m_i + (\alpha_j - \beta_j)\}^2.\]  

(13)

It is easy to see that the vertical intercept, $m_i$, is equal to zero when $R = 0$, and increases in $R$.\textsuperscript{14}

Litigant $i$’s contracts which satisfy her attorney's participation constraint, $\pi_i^N \geq R$, lie on or above her attorney's participation constraint curve. Thus they are located in the shaded area of Figure 1. Lemma 3 will be useful in Sections 3 and 4.

**Lemma 3.** Given litigant $j$’s contract, $(\alpha_j, \beta_j)$, as $\beta_i$ decreases along attorney $i$’s participation constraint curve, litigant $i$’s expected payoff, $G_i^N$, increases if and only if $(\alpha_i - \beta_i) + (\alpha_j - \beta_j) > 2(\alpha_i - \beta_i)(\alpha_j - \beta_j)$.

The proof of Lemma 3 is provided in Appendix C. Assume that litigant $j$’s contract is given such that $(\alpha_j - \beta_j) < 1$. Then, it follows from Lemma 3 that, as $\beta_i$ decreases along attorney $i$’s participation constraint curve, litigant $i$’s expected payoff increases as long as $(\alpha_i - \beta_i) < 1$. This implies immediately that litigant $i$’s expected payoff increases as $\beta_i$
decreases along attorney \( i \)'s participation constraint curve—in terms of the symbols, \( dG_i^N / d\beta_i < 0 \) in the first quadrant of the \( \beta_i \alpha_i \)-space (see Figure 1). The economic intuition behind Lemma 3 is clear. As \( \beta_i \) decreases along attorney \( i \)'s participation constraint curve, \( \alpha_i \) increases and attorney \( i \)'s contingent fee increases. A larger contingent fee results in a higher probability that attorney \( i \) wins the lawsuit in second-stage equilibrium. Hence, litigant \( i \)'s expected payoff increases if the effects (on \( G_i^N \)) of a higher probability of winning and less compensation to attorney \( i \) in the case of losing dominate the effect of more compensation to attorney \( i \) in the case of winning.

It follows from Lemmas 2 and 3 that, given litigant \( j \)'s contract, litigant \( i \)'s best contract lies in the second quadrant of the \( \beta_i \alpha_i \)-space and lies on attorney \( i \)'s participation constraint curve. This implies that, in the absence of any other constraints, the attorneys' equilibrium fixed fees are negative and their equilibrium expected payoffs are equal to the reservation wage.

3. THE NONNEGATIVE-FIXED-FEE CONSTRAINT

In this section, we consider the legal system with the nonnegative-fixed-fee constraint—the constraint that fixed fees should be nonnegative. More specifically, we consider a model which consists of the basic model plus the nonnegative-fixed-fee constraint. We first obtain the equilibrium fixed fees and contingent fees for the attorneys, and then examine the attorneys' effort levels and expected payoffs, and the litigants' expected payoffs in equilibrium.

To obtain the equilibrium contracts chosen by the litigants in the first stage, we begin by solving constrained-maximization problem (10) subject to the additional constraint of \( \beta_i \geq 0 \).

3.1. The Best Response of Each Litigant

Given litigant \( j \)'s contract, \((\alpha_j, \beta_j)\), litigant \( i \)'s best response to \((\alpha_j, \beta_j)\) is defined as a contract which maximizes her expected payoff, \( G_i^N \), subject to attorney \( i \)'s participation constraint, \( \pi_i^N \geq R \), and the nonnegative-fixed-fee constraint, \( \beta_i \geq 0 \). Denote it by \((\alpha_i^b, \beta_i^b)\). Using Figure 1 and Lemmas 2 and 3, we obtain: \( \alpha_i^b = \max \{k_i, m_i\} \) and \( \beta_i^b = 0 \). Because \( m_i \)
increases in $R$ while $k_i$ is independent of $R$, we have two different cases depending on the size of the reservation wage, $R$. Let $R'$ be the value of the reservation wage at which $m_i$ is equal to $k_i$. From equation (13), we obtain then $R' = k_i^3 \sqrt{v/\{(\alpha_j - \beta_j)^2 + (\alpha_j - \beta_i)\}}$. Lemma 4 describes the two cases.

**Lemma 4.** (a) In the case where $0 \leq R < R'$, we have $k_i > m_i$ and attorney $i$'s participation constraint is not binding. Litigant $i$'s best response to litigant $j$'s contract, $(\alpha_j, \beta_j)$, is then: $(\alpha_i^b, \beta_i^b) = (k_i, 0)$. (b) In the case where $R \geq R'$, we have $k_i \leq m_i$ and attorney $i$'s participation constraint is binding. Litigant $i$'s best response is then: $(\alpha_i^b, \beta_i^b) = (m_i, 0)$.

The proof of Lemma 4 is provided in Appendix D. Lemma 4 says that, given litigant $j$'s contract, litigant $i$'s optimal choice of the fixed fee for her attorney is 0. This can be explained as follows. Without the nonnegative-fixed-fee constraint, her optimal choice of the fixed fee would be negative (see Lemmas 2 and 3). But she cannot choose a negative fixed fee due to the constraint. Because she wants to make her attorney's contingent fee as high as possible in order to most strongly motivate him to win the lawsuit, faced with the constraint, she chooses 0 for the fixed fee.

Part (a) says that, when the reservation wage is low, litigant $i$'s best response to a given contract of her opponent is just the contract which maximizes her expected payoff, $G_i^N$, in the absence of her attorney's participation constraint. It says also that litigant $i$ chooses a contract which gives attorney $i$ an expected payoff higher than his reservation wage. We explain this as follows. Attorney $i$ will compete against attorney $j$ to win the lawsuit in the second stage. Litigant $i$ wants to induce attorney $i$ to exert the "optimal" effort — the optimal effort for litigant $i$ — by choosing the best contract, given litigant $j$'s contract, $(\alpha_j, \beta_j)$. In this case, the best contract — that is, litigant $i$'s best response — happens to yield attorney $i$'s expected payoff greater than his reservation wage, because his reservation wage is low.
Part (b) says that, when the reservation wage is high, the contract—which solves the maximization problem without attorney i’s participation constraint—yields attorney i’s expected payoff less than his reservation wage. Hence, to satisfy her attorney’s participation constraint, litigant i chooses a contract which lies on attorney i’s participation constraint curve.

In the real world, it is easily observed that a litigant, especially a plaintiff, chooses a contract with zero fixed fee. Does a litigant, in the real world, choose a contract which gives her attorney an expected payoff higher than his reservation wage? The answer may well be yes. McKee et al. (2007) report the evidence from a laboratory experiment that, when the quasi-fixed costs of litigation are sufficiently small, attorneys earn positive profits.

3.2. The Equilibrium Contracts of the Litigants

Let \((\alpha_1^*, \beta_1^*)\) represent litigant i’s contract which is specified in the subgame-perfect equilibrium of the two-stage game. We first obtain from Lemma 4 that \(\beta_1^* = \beta_2^* = 0\). In order to obtain \(\alpha_1^*\) and \(\alpha_2^*\), we use the litigants’ reaction curves in the \(\alpha_1\alpha_2\)-space. It follows from Lemma 4 that, given \(\beta_j^* = 0\), litigant i’s reaction curve in the \(\alpha_1\alpha_2\)-space is the graph of \(\alpha_j^* = \max\{k_j^o, m_j^o\}\), where \(k_j^o = -\alpha_j + (\alpha_j^2 + \alpha_j)^{1/2}\) and \(m_j^o\) satisfies \((m_j^o)^3 = R(m_j^o + \alpha_j)^2\), which are based on Lemma 2 and equation (13), respectively. Then the intersection of these two reaction curves determines \(\alpha_1^*\) and \(\alpha_2^*\).

Figure 2 is useful in obtaining \(\alpha_1^*\) and \(\alpha_2^*\). For concise exposition, we draw the graphs of \(k_j^o\) and \(m_j^o\) separately rather than draw the graph of \(\alpha_j^* = \max\{k_j^o, m_j^o\}\), which is litigant i’s reaction curve. Lemma B1 in Appendix B describes properties of the graphs in Figure 2. Using Lemma B1 and Figure 2, we obtain the following. If \(0 \leq R < v/12\), the intersection of the graphs of \(m_1^o\) and \(m_2^o\) lies on line segment \(OQ\); in this case, the intersection of the litigants’ reaction curves occurs at point \(Q\) – the intersection of the graphs of \(k_1^o\) and \(k_2^o\) – and thus we have \((\alpha_1^*, \alpha_2^*) = (1/3, 1/3)\). If \(v/12 \leq R < v/4\), the intersection of the graphs of \(m_1^o\) and \(m_2^o\) lies on line segment \(QS\); in this case, the intersection of the litigants’ reaction curves occurs at the
intersection of the graphs of \( m_1^o \) and \( m_2^o \), and thus we have \((\alpha_1^*, \alpha_2^*) = (4R/v, 4R/v)\). We report the equilibrium contracts of the litigants, \((\alpha_1^*, \beta_1^*)\) and \((\alpha_2^*, \beta_2^*)\), in Lemma 5.

**Lemma 5.** (a) If \( 0 \leq R < v/12 \), then \((\alpha_1^*, \alpha_2^*)\) occurs at the intersection of the graphs of \( k_1^o \) and \( k_2^o \): \((\alpha_1^*, \alpha_2^*) = (1/3, 1/3)\). (b) If \( v/12 \leq R < v/4 \), then \((\alpha_1^*, \alpha_2^*)\) occurs at the intersection of the graphs of \( m_1^o \) and \( m_2^o \): \((\alpha_1^*, \alpha_2^*) = (4R/v, 4R/v)\). (c) Regardless of the value of \( R \), where \( 0 \leq R < v/4 \), we have \( \beta_1^* = \beta_2^* = 0 \).

Lemma 5 implies that there are two types of the equilibrium-contracts pairs: the pairs of contracts at which neither of the attorneys' participation constraints is binding, and the pairs of contracts at which both attorneys' participation constraints are binding. The first type is associated with part (a) of Lemma 5, and the second type is associated with part (b).

Because we have identical litigants and identical attorneys, the litigants choose the same contract in equilibrium: \( \alpha_1^* = \alpha_2^* \) and \( \beta_1^* = \beta_2^* = 0 \). Therefore, the equilibrium contract of litigant \( i \) specifies that attorney \( i \) earns \( W_i^* = \alpha_i^* v \) if he wins the lawsuit, and \( L_i^* = \beta_i^* v = 0 \) if he loses it. This means that attorney \( i \)'s equilibrium fixed fee, which is paid to him regardless of the outcome of the lawsuit, is zero, and his equilibrium contingent fee, which is paid to him only if he wins the lawsuit, is \( \alpha_i^* v_i \). We give the intuition behind this result below Proposition 1.

### 3.3. Fixed Fees, Contingent Fees, and Expected Payoffs

Let \( x_i^* \) represent the effort level of attorney \( i \) which is specified in the subgame-perfect equilibrium. Let \( \pi_i^* \) and \( G_i^* \) represent the equilibrium expected payoff for attorney \( i \) and that for litigant \( i \), respectively. Then, based on Lemma 5, and using expressions (1) through (5) and Lemma 1, we obtain Proposition 1 (see also Table 1).
Proposition 1. (a) In the case where $0 \leq R < v/12$, the attorneys' fixed fees are $\beta_1^* v = \beta_2^* v = 0$; their contingent fees are $\alpha_1^* v = \alpha_2^* v = v/3$; their effort levels are $x_1^* = x_2^* = v/12$; and their expected payoffs are $\pi_1^* = \pi_2^* = v/12 > R$. The litigants' expected payoffs are $G_1^* = G_2^* = v/3$.

(b) In the case where $v/12 \leq R < v/4$, the attorneys' fixed fees are $\beta_1^* v = \beta_2^* v = 0$; their contingent fees are $\alpha_1^* v = \alpha_2^* v = 4R$; their effort levels are $x_1^* = x_2^* = R$; and their expected payoffs are $\pi_1^* = \pi_2^* = R$. The litigants' expected payoffs are $G_1^* = G_2^* = (v - 4R)/2 > 0$.

Proposition 1 says that, in the subgame-perfect equilibrium, each litigant chooses zero fixed fees for her attorney, regardless of the size of the reservation wage – implying that each litigant pays nothing to her attorney if he loses the lawsuit. This is because, by choosing zero fixed fees, each litigant makes her attorney's contingent fee as high as possible, and therefore most strongly motivates her attorney to win the lawsuit. Facing such a contract, attorney $i$ tries his best to win the lawsuit in the second stage, which is beneficial to litigant $i$.

Part (a) says that, when $0 \leq R < v/12$, each attorney's contingent fee is equal to one third of the litigants' valuation for winning the lawsuit. Part (b) implies that, as the reservation wage increases beyond $v/12$, each attorney's contingent fee increases. The intuition behind this is as follows. First, when the reservation wage increases, the litigants must offer their attorneys higher contingent fees in order to hire them. Second, when the opponent offers a higher contingent fee to her attorney, each litigant has an incentive to follow suit. Facing a more aggressive attorney of the opponent, each litigant must make her attorney more aggressive by increasing his contingent fee.

Another interesting finding in Proposition 1 is that, when $0 \leq R < v/12$, each attorney's equilibrium expected payoff is greater than the reservation wage. The gap between his equilibrium expected payoff and the reservation wage constitutes the *economic rent* for the attorney. This economic rent for each attorney is not created due to restrictions on entry into the attorney market, but created due to the litigants' strategic decisions on their attorneys'
compensation. Competing against the other litigant, each litigant needs to "overcompensate" her attorney in order to motivate him to work harder. In this case, while the litigants look benevolent, they are actually pursuing their self-interest.

Finally, when \( v/12 \leq R < v/4 \), the litigants must choose the contingent fees that guarantee their attorneys the reservation wage in order to hire them. This means that the attorneys' equilibrium expected payoffs are equal to the reservation wage.

3.4. Comparative Statics

We examine the effects of increasing the reservation wage on the attorneys' contingent fees, effort levels, and expected payoffs, and the litigants' expected payoffs in equilibrium. Using Proposition 1, we obtain Proposition 2.

**Proposition 2.** (a) As the reservation wage increases from zero, the attorneys' contingent fees, their effort levels, their expected payoffs, and the litigants' expected payoffs remain unchanged. This is true until the reservation wage is equal to \( v/12 \). (b) As the reservation wage increases beyond \( v/12 \), the attorneys' contingent fees, their effort levels, and their expected payoffs increase while the litigants' expected payoffs decrease.

Part (a) comes immediately from the fact that, for \( 0 \leq R < v/12 \), neither of the attorneys' participation constraints is binding in equilibrium, and thus the equilibrium contracts of the litigants are independent of the reservation wage: \( (\alpha_1^*, \beta_1^*) = (1/3, 0) \) and \( (\alpha_2^*, \beta_2^*) = (1/3, 0) \).

As the reservation wage increases beyond \( v/12 \), the attorneys' contingent fees increase. This can be explained as follows. First, for \( v/12 \leq R < v/4 \), both attorneys' participation constraints are binding, and thus given the equilibrium fixed fees of zero, the litigants must offer their attorneys higher contingent fees in order to hire them as the reservation wage increases. Second, when the opponent offers a higher contingent fee to her attorney, each litigant has an
incentive to follow suit. Facing a more aggressive attorney of the opponent, each litigant must make her attorney more aggressive by increasing his contingent fee.

In part (b), larger contingent fees in turn give the attorneys more incentives to win the lawsuit and make them exert more effort. Note, however, that the probability that each attorney wins the lawsuit in second-stage equilibrium remains constant. Therefore, the same probability of winning and larger contingent fees — as well as constant fixed fees — lead to smaller expected payoffs for the litigants. Because the attorneys' equilibrium expected payoffs are equal to the reservation wage, they increase as the reservation wage increases.

4. THE CONTINGENT-FEE CAP

In this section, we consider the legal system with the contingent-fee cap — that is, the model which consists of the basic model plus the contingent-fee cap. The cap is exogenously given. We first obtain the equilibrium fixed fees and contingent fees for the attorneys, and then examine the attorneys' effort levels, their expected payoffs, and the litigants' expected payoffs in equilibrium.

Recall that attorney's contingent fee is \( (\alpha_i - \beta_i)v \). Hence, a cap on attorney's contingent fee means a cap on \( \alpha_i - \beta_i \). Let \( \theta \) represent the cap on \( \alpha_i - \beta_i \), where \( 0 < \theta < 1 \). To obtain the equilibrium contracts chosen by the litigants in the first stage, we begin by solving constrained-maximization problem (10) subject to the additional constraint, \( \alpha_i - \beta_i \leq \theta \).

4.1. The Best Response of Each Litigant

Given litigant \( j \)'s contract, \( (\alpha_j, \beta_j) \), litigant \( i \)'s best response to \( (\alpha_j, \beta_j) \) is defined as a contract which maximizes her expected payoff, \( G_i^{N} \), subject to attorney \( i \)'s participation constraint, \( \pi_i^{N} \geq R \), and attorney \( i \)'s contingent-fee constraint, \( \alpha_i - \beta_i \leq \theta \). Figure 3 illustrates this new constrained-maximization problem. In the figure, straight line \( AH \) is the graph of \( \alpha_i - \beta_i = \theta \). We call it attorney \( i \)'s contingent-fee constraint line. Litigant \( i \)'s contracts which satisfy her attorney's participation constraint, \( \pi_i^{N} \geq R \), and her attorney's contingent-fee
constraint, \( \alpha_i - \beta_i \leq \theta \), lie in the shaded area of Figure 3. Using expressions (8) and (9), we find that, as \( \beta_i \) decreases along attorney \( i \)'s contingent-fee constraint line, litigant \( i \)'s expected payoff, \( G_i^N \), increases. Using Lemma 3 and attorney \( i \)'s contingent-fee constraint, \( \alpha_i - \beta_i \leq \theta < 1 \), we find that, as \( \beta_i \) decreases along attorney \( i \)'s participation constraint curve, litigant \( i \)'s expected payoff, \( G_i^N \), increases. It then follows from these findings and part (a) of Lemma 2 that, given litigant \( j \)'s contract, \((\alpha_j, \beta_j)\), litigant \( i \)'s best response to \((\alpha_j, \beta_j)\) occurs at point \( A \) — that is, at the intersection of attorney \( i \)'s participation constraint curve and attorney \( i \)'s contingent-fee constraint line.

4.2. The Equilibrium Contracts of the Litigants

Let \((\alpha_i^{**}, \beta_i^{**})\) represent litigant \( i \)'s contract which is specified in the subgame-perfect equilibrium of the new two-stage game. Recall from Section 4.1 that, given litigant \( j \)'s contract, \((\alpha_j, \beta_j)\), litigant \( i \)'s best response to \((\alpha_j, \beta_j)\) occurs at the intersection of attorney \( i \)'s participation constraint curve and attorney \( i \)'s contingent-fee constraint line. Attorney \( i \)'s participation constraint curve is given by expression (11), and attorney \( i \)'s contingent-fee constraint line is given by \( \alpha_i - \beta_i = \theta \). Then, the equilibrium contracts of the litigants, \((\alpha_1^{**}, \beta_1^{**})\) and \((\alpha_2^{**}, \beta_2^{**})\), must satisfy the following four equations simultaneously:

\[
\alpha_1^{**} - \beta_1^{**} = \theta \\
(\alpha_1^{**} - \beta_1^{**})^3 v = (R - \beta_1^{**} v)\{(\alpha_1^{**} - \beta_1^{**}) + (\alpha_2^{**} - \beta_2^{**})\}^2
\]

and

\[
\alpha_2^{**} - \beta_2^{**} = \theta \\
(\alpha_2^{**} - \beta_2^{**})^3 v = (R - \beta_2^{**} v)\{(\alpha_2^{**} - \beta_2^{**}) + (\alpha_1^{**} - \beta_1^{**})\}^2.
\]

The first two equations define litigant 1's best response to litigant 2's equilibrium contract, \((\alpha_2^{**}, \beta_2^{**})\), while the last two equations define litigant 2's best response to litigant 1's equilibrium contract, \((\alpha_1^{**}, \beta_1^{**})\). Lemma 6 reports the litigants' equilibrium contracts.
Lemma 6. The equilibrium contracts of the litigants are $(\alpha_1^{**}, \beta_1^{**}) = (\alpha_2^{**}, \beta_2^{**}) = (R/v + 3\theta/4, R/v - \theta/4)$.

Note that each litigant's equilibrium contract always lies on her attorney's participation constraint curve – that is, both attorneys' participation constraints are binding in equilibrium, regardless of the size of the reservation wage or that of the contingent-fee cap. Note also that each attorney's contingent-fee constraint is always binding in equilibrium: $\alpha_i^{**} - \beta_i^{**} = \theta$.

4.3. Fixed Fees, Contingent Fees, and Expected Payoffs

Let $x_i^{**}$ represent the effort level of attorney $i$ which is specified in the subgame-perfect equilibrium. Let $\pi_i^{**}$ and $G_i^{**}$ represent the equilibrium expected payoff for attorney $i$ and that for litigant $i$, respectively. Then, from Lemma 6, and using expressions (1) through (5) and Lemma 1, we obtain Proposition 3 (see also Table 1).

Proposition 3. The attorneys' contingent fees are: $(\alpha_1^{**} - \beta_1^{**})v = (\alpha_2^{**} - \beta_2^{**})v = \theta v$. Their fixed fees are: $\beta_1^{**}v = \beta_2^{**}v = R - \theta v/4$. Their effort levels are: $x_1^{**} = x_2^{**} = \theta v/4$. Their expected payoffs are: $\pi_1^{**} = \pi_2^{**} = R$. The litigants' expected payoffs are: $G_1^{**} = G_2^{**} = (2 - \theta)v/4 - R$.

Proposition 3 says that the equilibrium contingent fees are equal to the cap, regardless of the size of the reservation wage or of the contingent-fee cap. It says also that the equilibrium fixed fees are negative for $0 \leq R < \theta v/4$; they are zero for $R = \theta v/4$; and they are positive for $\theta v/4 < R < (2 - \theta)v/4$. In order to most strongly motivate her attorney to win the lawsuit, each litigant first chooses her attorney's contingent fee as high as possible, and then chooses his fixed fee (with which she cannot motivate him) so that both the contingent fee and the fixed fee can yield the attorney's equilibrium expected payoff equal to the reservation wage. This means that economic rents for the attorneys never exist.
When the reservation wage is low, the equilibrium fixed fees are negative. In this case, attorney \( i \) is required to pay the absolute value of \( \beta_i^{**} v \) to litigant \( i \) regardless of the outcome of the lawsuit. To put it differently, each attorney is required to purchase from his employer (or his client) – by paying the "employment fee" – both the right to compete in the litigation and the right to share the prize of \( v \) dollars with his employer when he wins the lawsuit. Another way to say this is that each attorney is required to post the "up-front performance bond" to secure the rights.

4.4. Comparative Statics

We examine the effects of increasing the reservation wage on the attorneys' fixed fees, their contingent fees, their effort levels, their expected payoffs, and the litigants' expected payoffs in equilibrium. We examine also the effects of increasing the contingent-fee cap. Using Proposition 3, we obtain Proposition 4.

Proposition 4. (a) As the reservation wage increases, the attorneys' contingent fees and their effort levels remain unchanged; the attorneys' fixed fees and their expected payoffs increase; the litigants' expected payoffs decrease. (b) As the contingent-fee cap increases – or, equivalently, as \( \theta \) increases – the attorneys' contingent fees and their effort levels increase; the attorneys' fixed fees and the litigants' expected payoffs decrease; the attorneys' expected payoffs remain unchanged.

As the reservation wage increases, the attorneys' equilibrium contingent fees remain unchanged because the given contingent-fee constraints are always binding in equilibrium. The litigants must then increase the fixed fees to guarantee the attorneys the increased reservation wage. Constant contingent fees result in constant effort levels expended by the attorneys which, in turn, make constant the probability that each attorney wins the lawsuit in second-stage equilibrium. Next, constant contingent fees, constant probabilities of winning, and larger fixed
fees lead to smaller expected payoffs for the litigants. Finally, because the attorneys' equilibrium expected payoffs are equal to the reservation wage, they increase as the reservation wage increases.

As the contingent-fee cap increases, the attorneys' contingent fees increase because they are always equal to the cap in equilibrium. Higher contingent fees, in turn, give the attorneys more incentives to win the lawsuit, and thus make them exert more effort. Given the reservation wage, as the contingent-fee cap increases, the attorneys' equilibrium expected payoffs remain unchanged because they are always equal to the reservation wage; their fixed fees decrease because their contingent fees increase. To guarantee the attorneys the given reservation wage, lower fixed fees are needed due to higher contingent fees. Finally, given that the probability that each attorney wins the lawsuit in second-stage equilibrium remains unchanged, a decrease in the fixed fee tends to increase each litigant's equilibrium expected payoff while an increase in the contingent fee tends to decrease her expected payoff. The former is more than offset by the latter, so that each litigant's expected payoff decreases as the contingent-fee cap increases.

5. COMPARING THE TWO LEGAL SYSTEMS

We have separately considered the legal system with the nonnegative-fixed-fee constraint, and the system with the contingent-fee cap. We now compare the two systems in several respects — see Table 1 — and highlight their differences and similarities.

First, the attorneys' fixed fees are always zero with the nonnegative-fixed-fee constraint, while they are negative or zero or positive with the contingent-fee cap — depending on the size of both the reservation wage and the contingent-fee cap. Second, in the system with the nonnegative-fixed-fee constraint, the attorneys' contingent fees are one third of the litigants' valuation for winning the lawsuit when $0 \leq R < v/12$; they are four times the reservation wage when $v/12 \leq R < v/4$. In the system with the contingent-fee cap, the contingent fees are always equal to the cap, regardless of the size of the reservation wage or that of the contingent-fee cap. Note that the nonnegative-fixed-fee constraints and the contingent-fee constraints are always
binding – that is, the fixed fees are always the lowest possible ones in the system with the nonnegative-fixed-fee constraint, and the contingent fees are always the highest possible ones in the system with the contingent-fee cap. Third, in both systems, each attorney's effort level is one fourth of his contingent fee, which results from employing the simplest logit-form litigation success functions. Fourth, in the system with the nonnegative-fixed-fee constraint, each attorney's expected payoff is greater than his reservation wage when $0 \leq R < v/12$; it is equal to the reservation wage when $v/12 \leq R < v/4$. By contrast, the payoff is always equal to the reservation wage in the system with the contingent-fee cap. In other words, the economic rents for the attorneys may exist in the system with the nonnegative-fixed-fee constraint, whereas they never exist in the system with the contingent-fee cap. Finally, each litigant's expected payoff is greater in the system with the contingent-fee cap than in the system with the nonnegative-fixed-fee constraint, regardless of the size of the reservation wage or the size of the contingent-fee cap.

Proposition 5 highlights these interesting results.

**Proposition 5.** (a) The economic rents for the attorneys may exist in the system with the nonnegative-fixed-fee constraint, whereas they never exist in the system with the contingent-fee cap. This implies that the attorneys prefer the system with the nonnegative-fixed-fee constraint to the system with the contingent-fee cap. (b) The litigants prefer the system with the contingent-fee cap to the system with the nonnegative-fixed-fee constraint.

Proposition 5 makes intuitive sense. With the nonnegative-fixed-fee constraint, the litigants are prohibited from choosing negative fixed fees, and thus may not be able to reduce fixed fees so that the attorneys' expected payoffs equal the reservation wage. This is indeed the case, when $0 \leq R < v/12$. By contrast, with the contingent-fee cap, the litigants benefit from two things. First, due to the cap, the litigants are forced to reduce their competition on contingent fees. Second, the litigants are allowed to choose negative fixed fees, which enables them to reduce their attorneys' expected payoffs to the reservation wage. Both contribute to
increasing the litigants' expected payoffs relative to the system with the nonnegative-fixed-fee constraint.

6. MODIFICATIONS

We have considered the legal systems which have either the nonnegative-fixed-fee constraint or the contingent-fee cap, but not both. What happens in the legal system with both the nonnegative-fixed-fee constraint and the contingent-fee cap? First, the attorneys' equilibrium fixed fees are zero or positive – depending on the size of both the reservation wage and the contingent-fee cap. Second, the contingent fees may be smaller than the cap. This occurs when the cap is relatively high. Third, the attorneys' expected payoffs may be greater than the reservation wage – that is, the economic rents for the attorneys may exist. However, these rents are smaller than or equal to those in the system with the nonnegative-fixed-fee constraint. Finally, the litigants' expected payoffs are greater than or equal to those in the system with the nonnegative-fixed-fee constraint, and are smaller than or equal to those in the system with the contingent-fee cap – depending on the size of both the reservation wage and the contingent-fee cap. Based on these and the previous results, we argue that, among the three legal systems, the attorneys prefer the system with the nonnegative-fixed-fee constraint while the litigants prefer the system with the contingent-fee cap. The hybrid system is ranked second for both the attorneys and the litigants.

The results in this paper may depend on the form of the litigation success function for attorney 1 (see function (1)). What happens if we use a general litigation success function, say, a general logit-form litigation success function? It seems that the modified model is not tractable. But we conjecture the following. First, the fixed fees are always zero in the system with the nonnegative-fixed-fee constraint. Why? The zero-fixed-fees result in the paper comes from the fact that $\partial G_i^N / \partial \beta_i < 0$ in the first quadrant of the $\beta_i \alpha_i$-space, when the reservation wage is small and thus attorney $i$'s participation constraint is not binding. On the other hand, it comes from the fact that $dG_i^N / d\beta_i < 0$ along attorney $i$'s participation constraint curve in the first quadrant, when
the reservation wage is large and thus attorney $i$'s participation constraint is binding. With a general litigation success function, we still have the fact that a decrease in $\beta_i$ increases litigant $i$'s expected payoff. Indeed, a decrease in $\beta_i$ — thus an increase in attorney $i$'s contingent fee — yields a higher probability of winning and less compensation to attorney $i$ in the case of losing, which leads to an increase in litigant $i$'s expected payoff. Second, Proposition 5 holds true. The reasons are as follows. In the system with the contingent-fee cap, the equilibrium expected payoffs for the attorneys are always equal to the reservation wage, regardless of the size of the reservation wage or that of the contingent-fee cap, even with a general litigation success function. In other words, the litigants are able to reduce their attorneys' expected payoffs to the reservation wage, even in the case of a general litigation success function. By contrast, in the system with the nonnegative-fixed-fee constraint, the attorneys' expected payoffs are greater than or equal to the reservation wage, depending on the size of the reservation wage; in other words, the litigants may not be able to reduce their attorneys' expected payoffs to the reservation wage.

What happens if we allow for free entry in the attorney market? Attorneys' entry into the market does not change any of the results as far as it does not change the reservation wage. If their entry changes the reservation wage, then it may affect the equilibrium contracts and others (see Sections 3.4 and 4.4).

7. CONCLUSIONS

We have considered litigation between a plaintiff and a defendant in which each litigant hires an attorney who expends his effort on her behalf, and the attorneys' effort is not verifiable to a third party. We have examined the equilibrium fixed and contingent fees for the attorneys in two legal systems: a system with the nonnegative-fixed-fee constraint and a system with the contingent-fee cap. We have examined also the attorneys' effort levels and expected payoffs, and the litigants' expected payoffs in equilibrium.
In Section 3, we had the constraint that fixed fees should be nonnegative— in other words, we set zero as the lower bound of fixed fees. Instead, if we set a positive or negative number as the lower bound, we will obtain similar qualitative results—for example, the equilibrium fixed fees will be equal to the lower bound of fixed fees. However, with a sufficiently small negative number as the lower bound, there will be no economic rents for the attorneys in equilibrium, regardless of the size of the reservation wage.

We have assumed that the litigants have the same valuation for winning the lawsuit. By considering litigation in which litigants have different valuations and attorneys have different reservation wages—depending on their ability for the litigation—we may be able to address the question of who hires whom. Other extensions of this paper include a model which incorporates the possibility of settlement and a model which explicitly introduces the objective merits of the case into the litigation success functions. We leave all these considerations for future research.
APPENDIX A

Proof of Lemma 2. (a) Using expressions (8) and (9), we obtain
\[
\frac{\partial G_1^N}{\partial \beta_1} = -v\{1 - p_1(x_1^N, x_2^N)\} + (1 - \alpha_1 + \beta_1)v\{\partial p_1(x_1^N, x_2^N)/\partial \beta_1\}
\]
and
\[
\frac{\partial G_2^N}{\partial \beta_2} = -vp_1(x_1^N, x_2^N) - (1 - \alpha_2 + \beta_2)v\{\partial p_1(x_1^N, x_2^N)/\partial \beta_2\}.
\]
It is straightforward to show that \(\partial p_1(x_1^N, x_2^N)/\partial \beta_1 < 0\) and \(\partial p_1(x_1^N, x_2^N)/\partial \beta_2 > 0\). Therefore, we have \(\partial G_1^N/\partial \beta_1 < 0\).

(b) Given litigant \(j\)'s contract, \((\alpha_j, \beta_j)\), and given \(\beta_i\), the first-order condition for maximizing \(G_i^N\) with respect to \(\alpha_i\) reduces to
\[
(\alpha_i - \beta_i)^2 + 2(\alpha_j - \beta_j)(\alpha_i - \beta_i) - (\alpha_j - \beta_j) = 0. \quad (A1)
\]
Solving this quadratic equation for \(\alpha_i\) gives \(\alpha_i = \beta_i + k_i\), where \(k_i = - (\alpha_j - \beta_j) + (\alpha_j - \beta_j)^2 + (\alpha_j - \beta_j)^5\). The second-order condition for maximizing \(G_i^N\) is satisfied.

APPENDIX B

Properties of the Graphs in Figure 2

Lemma B1. (a) \(k_i^o\) is increasing in \(\alpha_j\) at a decreasing rate. (b) As the reservation wage, \(R\), changes, the graph of \(k_i^o\) remains unchanged because \(k_i^o\) is independent of the reservation wage. (c) The intersection of the graphs of \(k_1^o\) and \(k_2^o\) occurs at point \(Q\) at point \((1/3, 1/3)\) on the 45\(^o\) line. (d) \(m_1^o\) is increasing in \(\alpha_j\) at a decreasing rate. (e) As the reservation wage increases, the graph of \(m_1^o\) shifts to the right while the graph of \(m_2^o\) shifts upward. (f) As the reservation wage increases, the intersection of the graphs of \(m_1^o\) and \(m_2^o\) always occurs on the 45\(^o\) line and moves up along the 45\(^o\) line.

The proof of Lemma B1 is straightforward and therefore omitted. When the reservation wage, \(R\), is equal to \(v/12\), the graphs of \(m_1^o\) and \(m_2^o\) pass through point \(Q\). Thus, it follows from part (f) of Lemma B1 that the intersection of the graphs of \(m_1^o\) and \(m_2^o\) lies on line segment \(OQ\) if \(0 \leq R < v/12\), and lies on line segment \(QS\) if \(v/12 \leq R < v/4\).
APPENDIX C

Proof of Lemma 3. We utilize the fact that along attorney $i$'s participation constraint curve,

$$dG_i^N = (\partial G_i^N / \partial \alpha_i)d\alpha_i + (\partial G_i^N / \partial \beta_i)d\beta_i$$

or, equivalently,

$$dG_i^N / d\beta_i = (\partial G_i^N / \partial \alpha_i)(d\alpha_i / d\beta_i) + \partial G_i^N / \partial \beta_i,$$

where $d\alpha_i / d\beta_i$ is given by expression (12). It is tedious but straightforward to show the lemma.

APPENDIX D

Proof of Lemma 4. (a) Recall that $0 < k_i < 1/2$ and $k_i$ is independent of $R$, and that $m_i = 0$ when $R = 0$ and $m_i$ increases in $R$. Because $m_i$ is equal to $k_i$ when $R = R'$, we have $k_i > m_i$ in the case where $0 \leq R < R'$. In this case, it follows from Lemma 2 that, given $\beta_i \geq 0$, attorney $i$'s participation constraint is not binding. Thus litigant $i$'s best response is the same as that resulting when her attorney's participation constraint is absent. Using Lemma 2, we obtain $(\alpha_i^b, \beta_i^b) = (k_i, 0)$.

(b) It is now easy to see that we have $k_i \leq m_i$ in the case where $R \geq R'$ (see the proof of part (a)). In this case, attorney $i$'s participation constraint is binding and litigant $i$'s best response must lie on attorney $i$'s participation constraint curve (see Lemma 2). Note that, due to the nonnegative-fixed-fee constraint, we have $0 < (\alpha_i - \beta_i) < 1$ and $0 < (\alpha_i - \beta_i) < 1$. This together with Lemma 3 implies that $dG_i^N / d\beta_i < 0$ along attorney $i$'s participation constraint curve in the first quadrant of the $\beta_i\alpha_i$-space. Thus we obtain $(\alpha_i^b, \beta_i^b) = (m_i, 0)$. 
Endnotes

1. See, for example, Danzon (1983), Rubinfeld and Scotchmer (1993), Dana and Spier (1993), Santore and Viard (2001), and Helland and Tabarrok (2003), for details. Contingent fees are used also in other countries such as Greece, Japan, and Korea. Some countries in Europe are considering allowing contingent fees (see Emons (2007)). Another outcome-contingent fee arrangement, called conditional fees, is used in Australia and the United Kingdom (see Hyde (2006) and Emons (2007)).


3. This is the so-called American rule of fee allocation. Under the English rule, the loser must pay the compensation of the winner's attorney as well as her own attorney's.

4. In fact, the American Bar Association Model Rules of Professional Conduct require that fixed fees in tort litigation should be nonnegative (see Santore and Viard (2001)).

5. This can be justified by the fact that many states in the United States have upper limits on contingent fees – more precisely, upper limits on contingent-fee percentages – for tort cases. See, for example, Danzon (1983), Rubinfeld and Scotchmer (1993), Hay (1996), and Emons (2000).

6. See, for example, Miceli (1994), Helland and Tabarrok (2003), and Copland and Tabarrok (2006), for debates over the concerns.

7. Imagine that, prior to trial, the judgment $v$ is taken from the defendant and held in escrow. An alternative way to model this litigation is that the plaintiff is trying to maximize an expected gain at trial, while the defendant is trying to minimize an expected loss. These two models, however, result in the same outcomes.
8. Alternatively, we can develop a model in which the litigants do not announce the contracts publicly. In this alternative model, each attorney chooses his effort level without knowing the contract for the rival attorney. To solve this game, we can use the solution technique for the *simultaneous-move game with sequential moves* introduced by Baik and Lee (2007). A preliminary analysis shows that, when \( \beta_1, \beta_2, \) and \( R \) are assumed to be zero, the equilibrium contracts of the litigants are \( \alpha_1^e = \alpha_2^e = 1/3 \).

9. Note that, given zero effort of his opponent, each attorney's best response is to expend infinitesimal effort.

10. We do not complete the analysis of the basic model. We analyze it to the extent necessary to obtain the results we need to analyze the main models in Sections 3 and 4. Each of the main models will add an additional constraint to constrained-maximization problem (10).

11. Throughout the paper, when we use \( i \) and \( j \) at the same time, we mean that \( i \neq j \).

12. Using Lemma 1, we obtain \( \partial x_i^N / \partial \beta_i < 0 \). The effect of decreasing \( \beta_i \) on the equilibrium effort level of attorney \( j \) in the second stage is not unidirectional: \( \partial x_j^N / \partial \beta_i \geq 0 \) if \( (\alpha_i - \beta_i) \leq (\alpha_j - \beta_j) \). As \( \beta_i \) decreases, the probability that attorney \( i \) wins the lawsuit in second-stage equilibrium increases: \( \partial p_1(x_1^N, x_2^N) / \partial \beta_1 < 0 \) and \( \partial p_1(x_1^N, x_2^N) / \partial \beta_2 > 0 \).

13. It is easy to see that \( k_i \) is positive but less than one half.

14. Because \( m_i \) increases in \( R \) while \( k_i \) is independent of \( R \), \( m_i \) is less than, equal to, or greater than \( k_i \) depending on the size of \( R \). Figure 1 illustrates the case where \( m_i < k_i \).

15. We will assume in Section 3.2 that the reservation wage is less than \( v/4 \).

16. A negative fixed fee means that attorney \( i \) is required to pay the amount to litigant \( i \) regardless of the outcome of the lawsuit. To put it differently, attorney \( i \) is required to purchase from litigant \( i \), by paying the amount, both the right to compete in the litigation and the right to share the prize of \( v \) dollars with litigant \( i \) when he wins the lawsuit.

17. Santore and Viard (2001) look at compensation for *plaintiffs'* attorneys in a framework in which the role of defense attorneys is ignored. In their model, both the plaintiff and her attorney
are risk-neutral; total litigation costs equal fixed costs plus the attorney's effort spent; the expected award is an increasing function of effort; the plaintiff cannot observe her attorney's effort; and the compensation structure for the attorney comprises a fixed fee and a contingent fee. Santore and Viard show that with the nonnegative-fixed-fee constraint, the plaintiff's optimal choice of the fixed fee is 0. They show also that if fixed costs are sufficiently small, then a minimum fixed fee equal to zero yields positive profits for attorneys.

Dana and Spier (1993), too, look at compensation for plaintiffs' attorneys in a framework in which the role of defense attorneys is ignored. In their model, the nonnegative-fixed-fee constraint is absent, and only the attorneys are experts — that is, the attorney has more precise information about the merits of the case than the plaintiff. Dana and Spier show that the equilibrium wage contract is upward sloping and linear in the award, and that the equilibrium fixed fee for the attorney is negative or zero or positive. Attorneys in their model earn positive ex post rents in equilibrium.

18. We must assume that the reservation wage is less than $v/4$. Otherwise — that is, if $R \geq v/4$ — the litigants end up with nonpositive expected payoffs, which implies that neither litigant has an incentive to hire an attorney at the beginning (see Proposition 1).

19. This result depends on the form of the litigation success function for attorney 1 (see function (1)). I conjecture that it may not hold true with a general litigation success function. In the United States, the contingent fee for the plaintiff's attorney is typically 25 percent to 42 percent of the reward obtained by the attorney. See, for example, Hay (1996).

20. In this case, each litigant's best reply to the other litigant's equilibrium contract is the contract which maximizes her expected payoff in the absence of her attorney's participation constraint.

21. Indeed, competition among potential attorneys to become this particular attorney, if any, cannot reduce the attorney's equilibrium expected payoff to the reservation wage. Santore and Viard (2001) show that if fixed costs are sufficiently small, the nonnegative-fixed-fee constraint can create economic rents for attorneys. Since their model is quite different from ours — in
particular, their model has only the plaintiff and her attorney, while our model has both sides in litigation – the comparison may not be possible or meaningful. However, using our framework, we may say that the rent created when looking at both sides (as in our model) is bigger, equal to, or smaller than that created when looking at only one side (as in their model). Which one is bigger depends on the contract for the defendant attorney exogenously given when looking at only the plaintiff side. In both models, attorneys' entry into the market does not affect the equilibrium contracts. In our model, however, it might affect the equilibrium contracts and others if it led to a change in the reservation wage.

22. We assume that the reservation wage is less than \((2 - \theta)\nu/4\). Otherwise, the litigants end up with nonpositive expected payoffs, which may imply that neither litigant has an incentive to hire an attorney at the beginning.

23. Recall that the cap on attorney \(i\)'s contingent fee is assumed to be less than the litigants' valuation for winning the lawsuit: \(0 < \theta < 1\). Recall also that the reservation wage is assumed to be less than \((2 - \theta)\nu/4\).

24. When the fixed fees are positive, the litigants may be confronted by the moral hazard problem: Each attorney takes many cases, but expends no effort in each case. If this problem occurs and the litigants have no way of dealing with it, then neither litigant has an incentive to hire an attorney at the beginning.
References


Table 1: Comparing the Two Legal Systems

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<th>Nonnegative-Fixed-Fee Constraint</th>
<th>Contingent-Fee Cap</th>
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<td>$0 \leq R &lt; (2 - \theta)v/4$</td>
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<td>$\theta v$</td>
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<tr>
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<td>$4R$ if otherwise</td>
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<tr>
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<td>$\theta v/4$</td>
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<td>Probability of Winning</td>
<td>$p_1(x_1^<em>, x_2^</em>) = 1/2$</td>
<td>$p_1(x_1^{<strong>}, x_2^{</strong>}) = 1/2$</td>
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<td>Expected Payoff</td>
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<td>$(v - 4R)/2$ if otherwise</td>
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Figure 1. Litigant $i$’s constrained-maximization problem
Figure 2. Obtaining $\alpha_1^*$ and $\alpha_2^*$
Figure 3. Introducing attorney $i$’s contingent-fee constraint