Attorneys' Compensation in Litigation with Bilateral Delegation

by

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Abstract

We consider litigation between a plaintiff and a defendant in which each player hires an attorney who expends his effort on her behalf. 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 system with the nonnegative-fixed-fee constraint, and the contingent fees are always equal to the cap in the system with the contingent-fee cap. We also examine the equilibrium expected payoffs for the attorneys and the payoffs for the players 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 players 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 is based on the observables and gives them little financial risk of participating in a lawsuit.

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), and Santore and Viard (2001). 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 also show that a high-quality attorney signals his quality by his willingness to take a relatively low fixed fee and a relatively high contingency percentage. Santore and Viard (2001) show that the nonnegativity constraint on fixed fees can create economic rents for attorneys.

The purpose of this paper is to consider litigation between a plaintiff and a defendant – in which each "player" hires an attorney who expends his effort on her behalf – focusing on the equilibrium fixed fees and contingent fees for the attorneys. The novelty of this paper is that, unlike the previous papers, we examine the equilibrium fixed fees and contingent fees for the attorneys by modeling the litigation as the two-player contest with bilateral delegation.[2]

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; both parties 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 aspects of litigation, especially those of the attorneys' compensation schemes.

The basic model consists of the following. The players 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.[3] The attorneys are risk-neutral. They have the same nonnegative reservation wage, and have equal ability for the lawsuit. We set up the following two-stage game. In the first stage, each player 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 players 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 player 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 also examine the attorneys' effort levels, their expected payoffs, and the players' expected payoffs in equilibrium. The first legal system is defined as the basic model plus the constraint that fixed fees should be nonnegative.[4] The second legal system is defined as the basic model plus the exogenously given cap on contingent fees.[5]

In the case of the legal system with the nonnegative-fixed-fee constraint, we show that each player 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 player can make her attorney's contingent fee as high as possible, so that she can most strongly motivate 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. We argue that this economic rent is created due to the players' strategic decisions on their attorneys' compensation.

In the case of the legal system with the contingent-fee cap, we show the following results. First, the attorneys' equilibrium fixed fees are negative or 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 that of the contingent-fee cap. Second, the equilibrium expected payoffs for the attorneys are always equal to the reservation wage – in other words, the economic rents for the attorneys never exist. Finally, other things being equal, as the contingent-fee cap increases, each player's equilibrium expected payoff decreases while the attorneys' equilibrium expected payoffs remain unchanged.

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 players' equilibrium expected payoffs in the two systems, we show that the players prefer the system with the contingent-fee cap.

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 (1999) 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 (2001) 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.

The paper proceeds as follows. Section 2 develops the basic model and sets up 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, and highlights their differences and similarities. Finally, Section 6 discusses the legal system with both the nonnegative-fixed-fee constraint and the contingent-fee cap, and offers our conclusions.

2. The basic model

Consider a lawsuit between a plaintiff and a defendant. For concise exposition, let us call the plaintiff player 1 and the defendant player 2. If player 1 wins the lawsuit, she receives v dollars from player 2. If player 2 wins the lawsuit, no money changes hands. Since the players' valuation for winning the lawsuit is v dollars, this litigation can be modeled as the contest in which the two players each want to win the prize of v dollars.[6] The players are risk-neutral, and bear their own legal costs, regardless of the outcome of the lawsuit.

Each player hires an attorney who expends his effort to win the lawsuit on her behalf. Each player designs her attorney's compensation scheme: Player 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, player i designs her attorney's compensation scheme by choosing the values of α_i and β_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 player i, his expected payoff must be greater than or equal to the reservation wage, given the compensation scheme designed by player i. If his expected payoff falls short of the reservation wage, attorney i prefers not to work for player i and accepts alternative employment instead.

We formally consider the following two-stage game. In the first stage, each player hires an attorney and writes a contract with him – in other words, player 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 players simultaneously announce the contracts written independently – that is, player 1 announces publicly the values of α_1 and β_1, and player 2 announces publicly the values of α_2 and β_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 player 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 probability-of-winning function for attorney 1 is given by:

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

Let π_i represent the expected payoff for attorney i. Then the payoff function for attorney 1 is

$$\begin{aligned} \pi_1 &= (W_1 - x_1)p_1(x_1, x_2) + (L_1 - x_1)(1 - p_1(x_1, x_2)) \\ &= \beta_1 v + (\alpha_1 - \beta_1)v p_1(x_1, x_2) - x_1. \end{aligned} \quad (2)$$

Similarly, the payoff function for attorney 2 is

$$\pi_2 = \alpha_2 v - (\alpha_2 - \beta_2)v p_1(x_1, x_2) - x_2. \quad (3)$$

Next, consider the players' expected payoffs computed in the first stage of the game – when player 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 player i's contract, (W_i, L_i), if her attorney wins the lawsuit in the second stage, player i's net payoff will be $v - W_i$; otherwise, player i will gain nothing, but should pay L_i to her attorney. Let G_i represent the expected payoff for player i. Then the payoff function for player 1 is

$$\begin{aligned} G_1 &= (v - W_1)p_1(x_1, x_2) + (-L_1)(1 - p_1(x_1, x_2)) \\ &= -\beta_1 v + (1 - \alpha_1 + \beta_1)vp_1(x_1, x_2). \end{aligned} \tag{4}$$

Similarly, the payoff function for player 2 is

$$G_2 = (1 - \alpha_2)v - (1 - \alpha_2 + \beta_2)vp_1(x_1, x_2). \tag{5}$$

Finally, we assume that all of the above is common knowledge among the players 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, (α_1, β_1) and (α_2, β_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, π_1, yields

$$(\alpha_1 - \beta_1)v(\partial p_1(x_1, x_2)/\partial x_1) = 1. \tag{6}$$

Given a positive effort level of attorney 1, the first-order condition for maximizing attorney 2's expected payoff, π_2, yields

$$-(\alpha_2 - \beta_2)v(\partial p_1(x_1, x_2)/\partial x_2) = 1.\text{[7]} \tag{7}$$

Attorney i's payoff function is strictly concave in his effort level. Thus the second-order condition for maximizing π_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*
$x_2^N = (\alpha_1 - \beta_1)(\alpha_2 - \beta_2)^2 v/\{(\alpha_1 - \beta_1) + (\alpha_2 - \beta_2)\}^2$.

2.2. The first stage of the game

Consider now the first stage in which the players choose their contracts, (α_1, β_1) and (α_2, β_2), simultaneously and independently. The players 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, (α_1, β_1) and (α_2, β_2). Then, using payoff functions (4) and (5), we obtain the players' payoff functions which take into account the Nash equilibrium of the second-stage subgame:

$$G_1^N = -\beta_1 v + (1 - \alpha_1 + \beta_1)vp_1(x_1^N, x_2^N) \tag{8}$$

and

$$G_2^N = (1 - \alpha_2)v - (1 - \alpha_2 + \beta_2)vp_1(x_1^N, x_2^N), \tag{9}$$

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 player should consider her attorney's participation constraint. Having perfect foresight about the Nash equilibrium of each second-stage subgame, the players 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, (α_1, β_1) and (α_2, β_2):

$$\pi_1^N \;=\; \beta_1 v + (\alpha_1 - \beta_1) v p_1(x_1^N, x_2^N) \;-\; x_1^N$$

and

$$\pi_2^N \;=\; \alpha_2 v - (\alpha_2 - \beta_2) v p_1(x_1^N, x_2^N) \;-\; x_2^N.$$

Attorney *i*'s participation constraint is then $\pi_i^N \geq R$.

Now player *i* faces the following constrained-maximization problem:

$$\underset{\alpha_i,\, \beta_i}{\text{Max}} \quad G_i^N \tag{10}$$

subject to $\pi_i^N \geq R$.

That is, taking the opponent's contract as given, player *i* seeks to maximize her expected payoff over (α_i, β_i), subject to her attorney's participation constraint. By doing so, she obtains her best response to the given contract of her opponent.

We will first look at the unconstrained-maximization problem: Maximize G_i^N over (α_i, β_i). Then, we will look at each attorney's participation constraint. Maximizing player *i*'s expected payoff in the absence of her attorney's participation constraint, we obtain Lemma 2.

Lemma 2. (*a*) *Given player j's contract,* (α_j, β_j), *and given* α_i, *player i's expected payoff is always decreasing in* β_i*: In terms of the symbols, we have* $\partial G_i^N/\partial\beta_i < 0$.[8] (*b*) *Given player j's contract,* (α_j, β_j), *and given* β_i, *player i's expected payoff is maximized at* $\alpha_i = \beta_i + k_i$, *where* $k_i = \,-(\alpha_j - \beta_j) + \{(\alpha_j - \beta_j)^2 + (\alpha_j - \beta_j)\}^{0.5}$.

Part (a) can be explained as follows. As β_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 in the case of losing lead to an increase in player *i*'s expected payoff.

In part (b), k_i is determined by the given contract of player j, and is treated as a constant. It is easy to see that k_i is positive but less than a half.[9] Note that k_i is independent of the players' valuation for winning the lawsuit, v, and the reservation wage, R. Then, 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.

Next, we look at attorney i's participation constraint. Consider first the graph of $\pi_i^N = R$ in the $\beta_i\alpha_i$-space, which is represented as

$$(\alpha_i - \beta_i)^3 v = (R - \beta_i v)\{(\alpha_i - \beta_i) + (\alpha_j - \beta_j)\}^2. \qquad (11)$$

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

$$d\alpha_i/d\beta_i = -(\alpha_j - \beta_j)^2\{3(\alpha_i - \beta_i) + (\alpha_j - \beta_j)\}/(\alpha_i - \beta_i)^2\{(\alpha_i - \beta_i) + 3(\alpha_j - \beta_j)\}. \qquad (12)$$

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

$$m_i^3 v = R\{m_i + (\alpha_j - \beta_j)\}^2. \qquad (13)$$

It is easy to see that the vertical intercept, m_i, is equal to zero when $R = 0$, and increases in R. Figure 1 illustrates attorney i's participation constraint curve. Player 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 describes a useful property of the curve.

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

We obtain Lemma 3 by utilizing the fact that $dG_i^N/d\beta_i = (\partial G_i^N/\partial\alpha_i)(d\alpha_i/d\beta_i)$ $+ \partial G_i^N/\partial\beta_i$ along the curve, where $d\alpha_i/d\beta_i$ is given by expression (12).

It follows from Lemma 3 that, given player *j*'s contract, $(\alpha_j,\ \beta_j)$, where $(\alpha_j - \beta_j) < 1$, as β_i decreases along attorney *i*'s participation constraint curve, player *i*'s expected payoff, G_i^N, increases as long as $(\alpha_i - \beta_i)$ is less than unity along the curve. This implies that, as β_i decreases along attorney *i*'s participation constraint curve in the first quadrant of the $\beta_i\alpha_i$-space, player *i*'s expected payoff always increases.

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 the 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, their expected payoffs, and the players' expected payoffs in equilibrium.

To obtain the equilibrium contracts chosen by the players 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 player

Given player *j*'s contract, $(\alpha_j,\ \beta_j)$, player *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 $R' = k_i^3 v/\{(\alpha_j - \beta_j)^2 + (\alpha_j - \beta_j)\}$. Lemma 4 describes the two cases.

Lemma 4. (a) *In the case where* $0 \leq R < R'$, *attorney i's participation constraint is not binding:* $k_i > m_i$. *Player i's best response to player j's contract,* (α_j, β_j), *is then:* $(\alpha_i^b, \beta_i^b) = (k_i, 0)$. ($b$) *In the case where* $R \geq R'$, *attorney i's participation constraint is binding:* $k_i \leq m_i$. *Player i's best response is then:* $(\alpha_i^b, \beta_i^b) = (m_i, 0)$.

Lemma 4 says that, given player *j*'s contract, player *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).[10] 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, player *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 also says that player *i* chooses a contract which gives attorney *i* an expected payoff higher than his reservation wage. The explanation for this follows. Attorney *i* will compete against attorney *j* to win the lawsuit in the second stage. Player *i* wants to induce attorney *i* to exert the "optimal" effort – the optimal effort for player *i* – by choosing the best contract, given player *j*'s contract, (α_j, β_j). In this case, the best contract – that is, player *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 take care of her attorney's participation constraint, player *i* chooses a contract which lies on attorney *i*'s participation constraint curve.

3.2. The equilibrium contracts of the players

Let $(\alpha_i^*,\ \beta_i^*)$ represent player 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 α_1^* and α_2^*, we utilize the players' reaction curves in the $\alpha_1\alpha_2$-space. It follows from Lemma 4 that, given $\beta_j^* = 0$, player i's reaction curve in the $\alpha_1\alpha_2$-space is the graph of $\alpha_i^b = \max\{k_i^o,\ m_i^o\}$, where $k_i^o = -\alpha_j + (\alpha_j^2 + \alpha_j)^{1/2}$ and m_i^o satisfies $(m_i^o)^3 v = R(m_i^o + \alpha_j)^2$, which are based on Lemma 2 and equation (13), respectively. The intersection of these two reaction curves determines α_1^* and α_2^*.

Figure 2 is useful in obtaining α_1^* and α_2^*. For concise exposition, we draw the graphs of k_i^o and m_i^o separately rather than draw the graph of $\alpha_i^b = \max\{k_i^o,\ m_i^o\}$, which is player i's reaction curve. Lemma 5 describes properties of the graphs in Figure 2.

Lemma 5. (a) *k_i^o is increasing in α_j at a decreasing rate.* (b) *m_i^o is increasing in α_j at a decreasing rate.* (c) *The intersection of the graphs of k_1^o and k_2^o occurs at point Q on the* 45° *line.* (d) *The intersection of the graphs of m_1^o and m_2^o always occurs on the* 45° *line.* (e) *As the reservation wage, R, increases, the graph of m_1^o shifts to the right while the graph of m_2^o shifts upward.*

Lemma 5 says that, as the reservation wage increases, the intersection of the graphs of m_1^o and m_2^o moves up along the 45° line – also called straight line *OS*. However, note that, as the reservation wage changes, the graphs of k_1^o and k_2^o remain unchanged because k_i^o is independent of the reservation wage.

Using Lemma 5 and Figure 2, we obtain α_1^* and α_2^*, and report them in Lemma 6.

Lemma 6. (a) *If the intersection of the graphs of m_1^o and m_2^o lies on line segment OQ, or equivalently, if* $0 \le R < v/12$, *then* $(\alpha_1^*,\ \alpha_2^*)$ *occurs at point Q:* $(\alpha_1^*,\ \alpha_2^*) = (1/3,\ 1/3)$. ($b$) *If the intersection of the graphs of m_1^o and m_2^o lies on line segment QS, or equivalently, if* $v/12 \le R < v/4$, *then* $(\alpha_1^*,\ \alpha_2^*)$ *occurs at this very intersection:* $(\alpha_1^*,\ \alpha_2^*) = (4R/v,\ 4R/v)$.[11]

Lemma 6 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 6, and the second type is associated with part (b).

Because we have identical players and identical attorneys, the players choose the same contract in equilibrium: $\alpha_1^* = \alpha_2^*$ and $\beta_1^* = \beta_2^* = 0$. Therefore, the equilibrium contract of player *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 is zero, and his equilibrium contingent fee is $\alpha_i^* v_i$.

3.3. The 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 π_i^* and G_i^* represent the equilibrium expected payoff for attorney *i* and that for player *i*, respectively. Then, based on Lemma 6 and the result that $\beta_1^* = \beta_2^* = 0$, and using expressions (1) through (5) and Lemma 1, we obtain Proposition 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:* $x_1^* = x_2^* = v/12$. *Their expected payoffs are:* $\pi_1^* = \pi_2^* = v/12 > R$. *The players' 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:* $x_1^* = x_2^* = R$. *Their expected payoffs are:* $\pi_1^* = \pi_2^* = R$. *The players' expected payoffs are:* $G_1^* = G_2^* = (v - 4R)/2 > 0$.

Proposition 1 says that, in the subgame-perfect equilibrium, each player chooses zero fixed fees for her attorney, regardless of the size of the reservation wage – implying that each player pays nothing to her attorney if he loses the lawsuit. This is because, by choosing zero fixed fees, each player can make her attorney's contingent fee as high as possible, and therefore most strongly motivate her attorney to win the lawsuit. Proposition 1 also says that, when the reservation wage is low, each attorney's contingent fee is equal to one third of the players' valuation for winning the lawsuit.[12]

The players have the same valuation for winning the lawsuit. The attorneys have the same reservation wage and have equal ability for the lawsuit. Therefore, in equilibrium, the players choose the same contingent fees for their attorneys. This, in turn, leads to the same effort level expended by the attorneys, the same expected payoff for the attorneys, and the same expected payoff for the players. This is natural because the attorneys are motivated equally by the same contingent fee to win the lawsuit.

Another interesting finding in Proposition 1 is that, when the reservation wage is low, the attorneys' equilibrium expected payoffs are greater than the reservation wage.[13] This gap – constituting the *economic rents* for the attorneys – is totally due to the players' strategic decisions on their attorneys' compensation. Competing against the other player, each player needs to "overcompensate" her attorney in order to motivate him to work harder. In this case, while the players look benevolent, they are actually pursuing their self-interest. It is obvious that the economic rents for the attorneys exist due to the nonnegative-fixed-fee constraint.[14]

Finally, when the reservation wage is high, the players 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, their effort levels, their expected payoffs, and the players' 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 players' 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 players' 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 players 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 players 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 player has an incentive to follow suit. Facing a more aggressive attorney of the opponent, each player 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 players. 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 players' expected payoffs in equilibrium.

Recall that attorney i's contingent fee is $(\alpha_i - \beta_i)v$. Hence, a cap on attorney i's contingent fee means a cap on $\alpha_i - \beta_i$. Let θ represent the cap on $\alpha_i - \beta_i$, where $0 < \theta < 1$. To obtain the equilibrium contracts chosen by the players 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 player

Given player j's contract, (α_j, β_j), player i's best response to (α_j, β_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. Player 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 β_i decreases along attorney i's contingent-fee constraint line, player 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 β_i decreases along attorney i's participation constraint curve, player i's expected payoff, G_i^N, increases. It then follows from these findings and part (a) of Lemma 2 that, given player j's contract, (α_j, β_j), player i's best response to (α_j, β_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 players

Let $(\alpha_i^{**}, \beta_i^{**})$ represent player i's contract which is specified in the subgame-perfect equilibrium of the new two-stage game. Recall from Section 4.1 that, given player j's contract, (α_j, β_j), player i's best response to (α_j, β_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 players, $(\alpha_1^{**}, \beta_1^{**})$ 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 player 1's best response to player 2's equilibrium contract, $(\alpha_2^{**}, \beta_2^{**})$, while the last two equations define player 2's best response to player 1's equilibrium contract, $(\alpha_1^{**}, \beta_1^{**})$. Lemma 7 reports the players' equilibrium contracts.

Lemma 7. *The equilibrium contracts of the players are* $(\alpha_1^{**}, \beta_1^{**}) = (\alpha_2^{**}, \beta_2^{**}) = (R/v + 3\theta/4, R/v - \theta/4)$.

Note that each player'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. The 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 π_i^{**} and G_i^{**} represent the equilibrium expected payoff for attorney *i* and that for player *i*, respectively. Then, from Lemma 7, and using expressions (1) through (5) and Lemma 1, we obtain Proposition 3.

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 players' expected payoffs are:* $G_1^{**} = G_2^{**} = (2 - \theta)v/4 - R$.

First of all, as in the system with the nonnegative-fixed-fee constraint, because the players have the same valuation for winning the lawsuit and because the attorneys have the same reservation wage and have equal ability for the lawsuit, the players choose the same fixed fee and the same contingent fee for their attorneys in equilibrium, regardless of the size of the contingent-fee cap or that of the reservation wage, R, where $0 \leq R < (2 - \theta)v/4$.[15] The same contingent fee for the attorneys in turn lead to the same effort level expended by the attorneys, the same expected payoff for the attorneys, and the same expected payoff for the players.

Proposition 3 says that the equilibrium contingent fees are equal to the cap, regardless of the size of the reservation wage or that of the contingent-fee cap.[16] It also says that the equilibrium fixed fees are negative for $0 \leq R < \theta v/4$; they are zero for $R = \theta v/4$; they are positive for $\theta v/4 < R < (2 - \theta)v/4$.[17] In order to most strongly motivate her attorney to win the lawsuit, each player 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 the 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 player 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 players' expected payoffs in equilibrium. We also examine 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 players' expected payoffs decrease.* (*b*) *As the contingent-fee cap increases – or, equivalently, as θ increases – the attorneys' contingent fees and their effort levels increase; the attorneys' fixed fees and the players' 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 players 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 players. 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, less 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 player'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 player'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, 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 players' valuation for winning the lawsuit when the reservation wage is low; they are four times the reservation wage when the reservation wage is high. 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 probability-of-winning functions. Fourth, in the system with the nonnegative-fixed-fee constraint, each attorney's expected payoff is greater than his reservation wage when the reservation wage is low; it is equal to the reservation wage when the reservation wage is high. 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 player'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 players 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 players 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 the reservation wage is low. By contrast, with the contingent-fee cap, the players benefit from two things. Firstly, due to the cap, the players are forced to reduce their competition on contingent fee. Secondly, the players 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 players' expected payoffs relative to the system with the nonnegative-fixed-fee constraint.

6. Conclusions

We have considered litigation between a plaintiff and a defendant in which each player hires an attorney who expends his effort on her behalf. We have examined the equilibrium fixed fees and contingent fees for the attorneys in the two legal systems: the system with the nonnegative-fixed-fee constraint and the system with the contingent-fee cap. We have also examined the attorneys' effort levels, their expected payoffs, and the players' expected payoffs in equilibrium.

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 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 players' 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 players prefer the system with the contingent-fee cap. The hybrid system is ranked second for both the attorneys and the players.

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 players have the same valuation for winning the lawsuit. By considering litigation in which players 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.

Footnotes

1. See, for example, Danzon (1983), Rubinfeld and Scotchmer (1993), and Santore and Viard (2001), for details.

2. Many economists have studied the theory of contests: Appelbaum and Katz (1987), Dixit (1987), Hillman and Riley (1989), Ellingsen (1991), Nitzan (1991), Baik and Shogren (1992), Baye et al. (1993), Che and Gale (1998), and Konrad (2000), to name a few. Baik and Kim (1997), Wärneryd (2000), and Konrad et al. (2004) study delegation in contests.

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. This is justified by the fact that the American Bar Association Model Rules of Professional Conduct require that fixed fees in tort litigation should not be negative (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. 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.

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

8. Throughout the paper, when we use i and j at the same time, we mean that $i \neq j$.

9. Note that k_i is less than a half if and only if $\{(\alpha_j - \beta_j)^2 + (\alpha_j - \beta_j)\}^{0.5}$ is less than $0.5 + (\alpha_j - \beta_j)$. The latter is proven easily.

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

11. We must assume that the reservation wage is less than $v/4$. Otherwise – that is, if $R \geq v/4$ – the players end up with nonpositive expected payoffs, which implies that the players each have no incentive to hire an attorney at the beginning (see Proposition 1).

12. 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).

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

14. Santore and Viard (2001) also show in a different framework that the nonnegative-fixed-fee constraint can create economic rents for attorneys, and argue that the constraint can be understood as a means of maintaining the attorneys' economic rents.

15. We must assume that the reservation wage is less than $(2-\theta)v/4$. Otherwise, as we see in Proposition 3, the players end up with nonpositive expected payoffs, which implies that the players each have no incentive to hire an attorney at the beginning.

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

17. When the fixed fees are positive, the players 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 players have no way of dealing with it, then the players each have no incentive to hire an attorney at the beginning. I thank one of the referees for pointing out this possibility.

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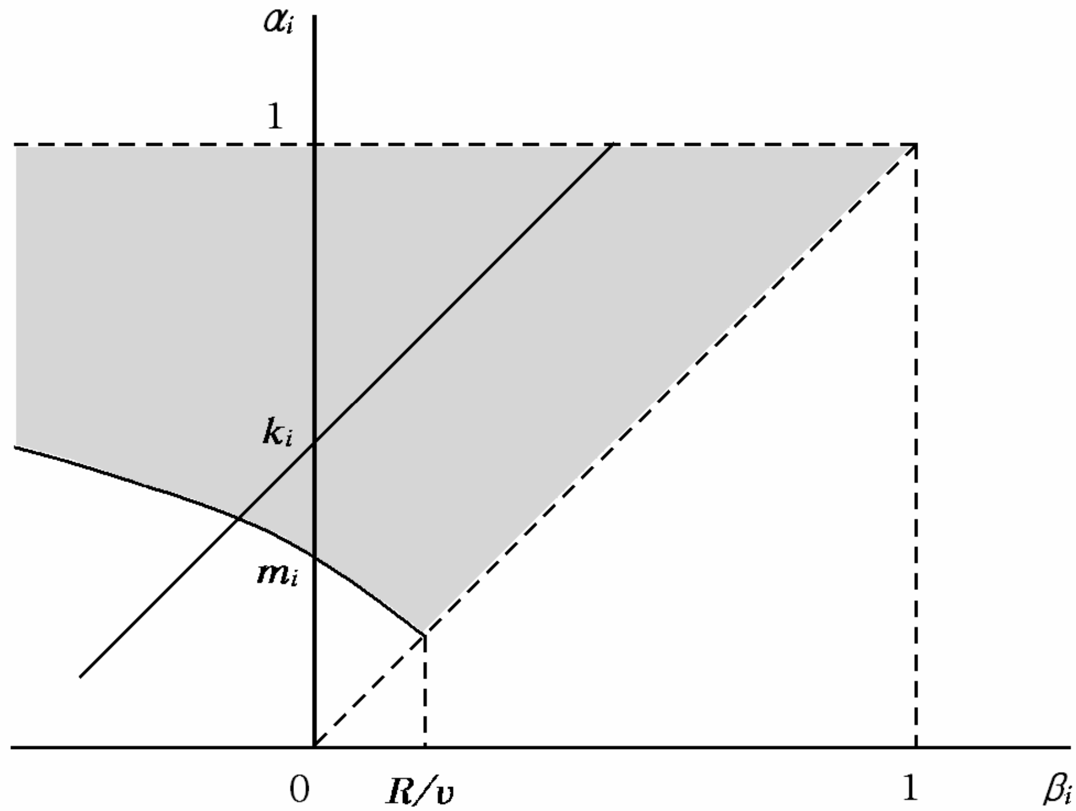

Figure 1. Player *i*'s constrained-maximization problem.

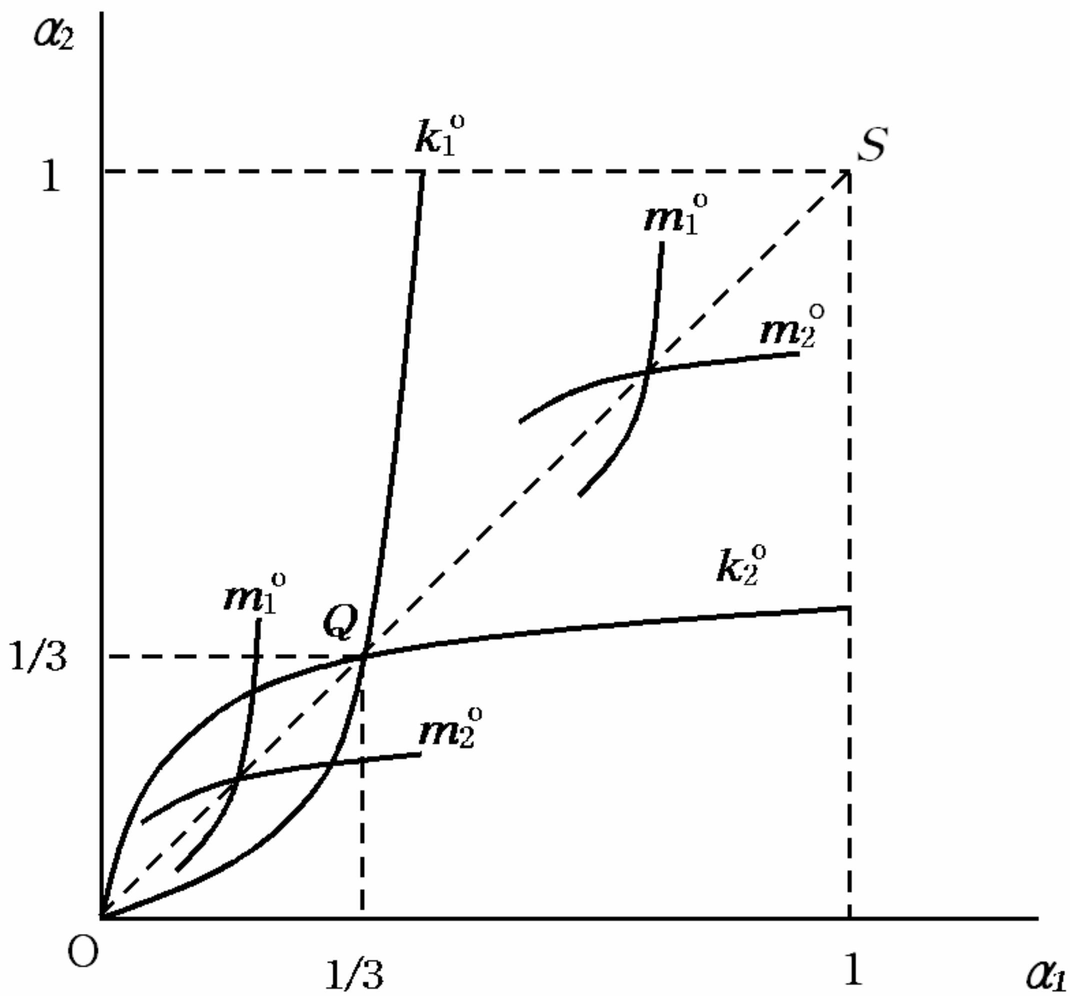

Figure 2. Obtaining α_1^* and α_2^*.

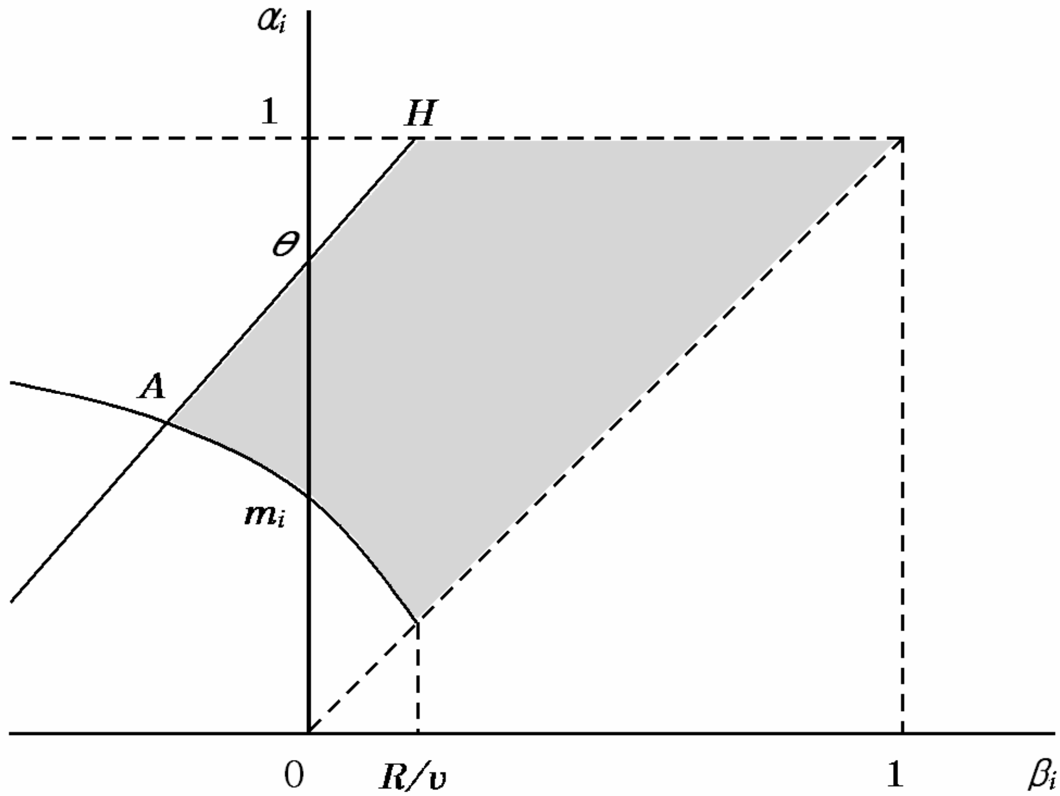

Figure 3. Introducing attorney *i*'s contingent-fee constraint**.**