Legal Expenses Insurance and Settlement

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Abstract

In this paper we consider the effect of legal expenses insurance on settlement. Using a one-shot asymmetric information model of litigation, we scrutinize the litigants' interactions under the situations that the plaintiff is before-the-event insured, after-the-event insured or self-funded. We investigate the effects of insurance on settlement probabilities, settlement amounts, care levels and the plaintiff's welfare. We also show how the model can be amended to include 'recoverable' element of the insurance. Our results exhibit that insurance increases the plaintiff's expectation on settlement amount but its effects on settlement probabilities and care levels depend on the distribution of the accident loss. Insurance can either increase or decrease welfare.

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1 Introduction

The question of how to assure access to justice is a fundamental question in all jurisdictions. It involves making available suitable institutions and expertise to help access these, at an affordable price and in ways that help share the risk of what may be very uncertain negotiations. The presence of litigation risks has encouraged several market responses. In the US, it is common for individual plaintiffs to retain lawyers on a contingent basis, thereby shifting some risk on costs to their agent. Alternatively, the majority of European jurisdictions have well developed insurance markets where protection against the risk of legal expense can be purchased. Within some other jurisdictions, such as England and Wales, although the market for legal expenses insurance has developed slowly, policy makers have been looking to substitute private insurance for the increasingly expensive social insurance against legal expense provided by legal aid. The interesting feature of this new policy is that the insurance is bought "after-the-event" (ATE), as opposed to more traditional "before-the-event" (BTE) legal insurance. Although in most Asian countries legal expenses insurance (LEI) does not officially exist, some countries such as China and Japan are considering introducing it. Thus LEI becomes a topic with potentially broad appeal. Furthermore, "access to justice" is not the only purpose of the new institutions. Minimising total social (legal) cost is another important goal (Gravelle & Waterson 1993). It may be fulfilled by encouraging settlement and reducing

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accidents.[1] However, the effect of insurance on social cost is still unclear.

The purpose of our paper is to consider the effects of LEI on the litigants' behaviour. A number of other authors have looked at various aspects of the problem we study, while most literature focuses on LEI as a risk sharing mechanism. Only few articles view insurance as a strategic implement. None of these work, however, scrutinize the effect of insurance on settlement and social welfare. In itself, this means that there is a gap in terms of the institutional detail that has been researched. Perhaps more importantly, however, it means that the after-the-event innovation has received no attention.[2]

The paper is structured as follows. Section 2 sets up our basic model. Section 3 looks at the role of insurance in the settlement of a one-shot litigation game with asymmetric information. This follows the model in Gravelle & Waterson (1993). By and large, we assume that insurance is purchased by a risk neutral plaintiff so we, effectively, view this as a strategic decision (Kirstein 2000). In Section 4, recoverability of insurance premium and the uniform distribution are discussed. Finally, Section 5 offers our concluding remarks.

2 The model

Based on the model of Gravelle & Waterson (1993), we use a litigation model to illustrate the effects of legal expenses insurance on litigants' behaviours. A risk neutral potential defendant (D) is engaged in an activity which has the probability π of imposing a random loss L on a risk neutral plaintiff (P). The value of loss is private information of the plaintiff, the defendant only knows the distribution function of the loss $Q(L)$ and its density $q(L)$. This is in common with earlier literature, e.g. Reinganum & Wilde (1986) and Gravelle (1993). The defendant can reduce the probability of the accident π by expenditure x on care, where $\pi'(x) < 0$ and $\pi''(x) > 0$. If the accident occurs the plaintiff retains a lawyer who is assumed to be risk neutral. The defendant then makes a single "take it or leave it" settlement offer S to (P). If the case is settled, the lawyer charges a fee f^S. If the offer is rejected by (P), the case goes to trial. The plaintiff's probability of winning at trial is p. If he does win, he is awarded his loss L.[3] The litigation costs are public information for both parties since they are less likely to be victim specific.[4] The lawyer charges f^w if the case wins at trial or f^0 if it loses. Since fee shifting rules exist, the loser has to pay the

[1]If the effort of avoiding the accident is very costly, there is a possibility that (at a certain level) total social cost will increase by reducing accidents. This is the issue of how to design the negligence rule. In this paper we do not focus on the negligence rule, but we will discuss the cost of care and its welfare implications.

[2]Heyes, Rickman & Tzavara (2004) consider the purchase of LEI by a risk averse plaintiff in a similar model. Baik & Kimb (2007) compare contingent fees with LEI. However, none of them consider the ATE insurance.

[3]To keep the analysis manageable we ignore the possibilities of over-compensation and under-compensation from the judgement.

[4]However, the litigation costs may be loss specific. One explanation for this is that high loss cases have longer pre-trial negotiation periods. Our dynamic model in the discussion section will provide a reasonable illustration to this assumption.

winner a proportion k of total legal fees. Thus, the expected legal fees transfer from D to P is $t = k[pf^w - (1-p)f^D]$ where f^D is the defendant's total legal fees. For legal fees, by definition we have $f^0 \leqslant f^w$ and $f^S < f^w$.

The plaintiff's litigation costs can be funded either by himself or by BTE insurance or by ATE insurance. The interaction takes place in four stages :

- The insurance stage: P decides whether to purchase legal expenses insurance.
- The accident stage: An accident occurs with probability π. P incurs a loss L in the event of the accident.
- The settlement stage: D makes a settlement offer S. If P accepts the offer, the game ends; if he does not, the case goes to trial.
- The trial stage: P wins with probability p. If he does win, he is awarded a compensation L plus shifting part or all his legal fees to D.[5]

We distinguish the plaintiff's funding methods by the timing of the above stages. If the insurance stage happens prior to the accident stage, we have a case of BTE insurance. If the insurance stage happens after the accident stage, we have a case of ATE insurance. If there is no the insurance stage, the plaintiff is self-funded. For simplification, we assume that the defendant is self-funded, which is common knowledge in our game.

3 The effects of legal expenses insurance

3.1 The willingness to settle

The **lawyer**, if selfish, would accept settlement if and only if

$$f^S - c_0 \geqslant pf^w + (1-p)f^0 - c_P, \tag{1}$$

where the left hand side is her net receipts if the case is settled and the right hand side is the expected net proceeds from a trial. Thus, her expected gain from settlement compared with trial is

$$G^A = f^S - pf^w - (1-p)f^0 + c_P - c_0.$$

Here, c_0 is the pre-trial legal cost incurred for P by A, while c_P is the total legal cost (the sum of pre-trial and trial costs). It is clear that in this general model the plaintiff's loss from the accident has no direct impacts on her expected gain from settlement. Also, her gain does not rely on whether the plaintiff purchases insurance or not.

A well informed **self-funded plaintiff** would accept the settlement offer S if

$$S - f^S \geqslant p(L - f^w) - (1-p)f^0 + t, \tag{2}$$

[5] We divide the entire litigation game by its subgames. If we combine the last two stages together as a litigation stage, our description becomes consistent with the one in Kirstein (2000). This will not affect the analysis.

the expected gain from acceptance compared with trial for him is:

$$G^{PS} \quad = \quad S - pL + pf^w + (1-p)f^0 - f^S - t.$$

The self-funded plaintiff would accept an offer S if and only if $G^{PS} \geqslant 0$. Since G^{PS} is decreasing in L, if there exists $\ell \in [L_0, L_1] : G = 0$ then ℓ is the unique acceptance level.[6] Equivalently, when S is given, he would accept an offer whenever $\ell^{PS}(S, \cdot) \geqslant L$ where ℓ^{PS} is the self-funded plaintiff's acceptance level defined by $G^{PS} = 0$.

Now we consider a well informed **insured plaintiff**.[7] The settlement offer normally includes two parts: the compensation of loss and the reimbursement of legal costs. We assume the plaintiff's legal costs have to be paid by himself if accepting settlement. Therefore, the plaintiff's net receipt is only the compensation of the loss. He would accept the settlement offer S if

$$S - f^S \geqslant pL, \tag{3}$$

So his expected gain from settlement is

$$G^{PI} \quad = \quad S - pL - f^S.$$

As in the self-funded situation, we define this acceptance level as $\ell^{PI}(S, \cdot)$.

Now, we assume that the plaintiff's legal knowledge is limited such that he always accepts his lawyer's advice on accepting or rejecting a settlement offer. Since there may be potential conflicts of interest over settlement between the plaintiff and the lawyer if their acceptance levels are different, we introduce the weight parameter $\lambda \in [0, 1]$, so that the total gain from settlement is given by

$$G = \lambda G^P + (1-\lambda)G^A. \tag{4}$$

Therefore, the **self-funded plaintiff** will accept the settlement offer whenever:

$$\lambda(S-f^S)+(1-\lambda)(f^S-c_0) \geqslant \lambda[p(L-f^w)-(1-p)f^0+t]+(1-\lambda)[pf^w+(1-p)f^0-c_P] \tag{5}$$

Similarly, the **insured plaintiff** will accept the settlement offer whenever

$$\lambda(S - f^S) + (1-\lambda)(f^S - c_0) \geqslant \lambda pL + (1-\lambda)[pf^w + (1-p)f^0 - c_P] \tag{6}$$

For the situations above, if (5) and (6) hold as an equality separately, each of them has zero gain from settlement $G = 0$. Note that, the plaintiff's probability of winning actually reflects the difficulty of the case, e.g. a low p means it is a difficult case to win. We can note some results:

[6] There are also another two cases to consider. First, if there exists $\ell \in [L_0, L_1] : G > 0$ then all the offers are accepted. Second, if there exists $\ell \in [L_0, L_1] : G < 0$ then all the offers are rejected. We assume these two cases do not arise since in these cases the acceptance level is independent from the settlement offer.

[7] Since the insurance stage happens before the settlement stage, we do not need to distinguish BTE and ATE insurance until analysing the plaintiff's *ex ante* welfare. Also, in this section, we assume the insurance premium is unrecoverable by the losing party. The recoverable premium is discussed in Section 4.

Result 1. *The acceptance level $\ell(S, \lambda, p, \cdot)$ (1) increases with the settlement offer at the rate $\partial\ell/\partial S = 1/p$ whether the plaintiff is insured or not; (2) increases with the difficulty of the case and is more sensitive if the plaintiff is self-funded under the English cost rule; (3) varies with fee arrangements.*

Since the lawyer's gain from settlement is independent from the plaintiff's insurance status, the difference in gains from settlement for the self-funded and insured plaintiff is:

$$\Delta G = \lambda(G^{PS} - G^{PI}) = \lambda[pf^w + (1-p)f^0 - t].$$

Equivalently, the difference between acceptance levels is:

$$\Delta\ell = \ell^{PS} - \ell^{PI} = \lambda\frac{pf^w + (1-p)f^0 - t}{p}.$$

Note that $0 \leqslant k \leqslant 1$ and $p < 1$. Substituting $t = k[pf^w - (1-p)f^D]$ into the above equation, yields

$$\Delta\ell = \lambda\frac{(1-k)pf^w + (1-p)f^0 + k(1-p)f^D}{p} > 0 \tag{7}$$

Result 2. *Given the defendant's settlement offer, if the plaintiff purchases insurance, his acceptance level becomes lower.*

By the definition of acceptance level ℓ, the probability of a given offer S being accepted is $Q(\ell)$, where $q(\ell) > 0$. The higher the acceptance level, the higher the probability of settlement, and *vice versa*. Thus, if we do not consider the reaction of the defendant, given a settlement offer, insurance induces trial rather than settlement. This is consistent with Heyes et al. (2004)'s results.

3.2 The defendant's settlement offer

The defendant chooses the settlement offer S to minimise his expected post-accident costs H given that acceptance level is a function of S and the distribution function of loss Q:

$$H = Q(\ell)S + [1 - Q(\ell)](f^D + t) + p\int_{\ell}^{L_1} LdQ. \tag{8}$$

The first order condition defining optimal settlement offer S^* is:

$$\frac{dH}{dS} = Q(\ell) + \frac{q(\ell)}{p}(S^* - p\ell - f^D - t) = 0. \tag{9}$$

Obviously, the corner solution of the settlement offer is $S^* = f^D + t$. This implies that the defendant increases the settlement offer if and only if the trial is more costly than settlement and the increase in the settlement offer reduces the probability of the trial ($q\partial\ell/\partial S = q/p$). Rearranging equation (9), the settlement offer S^* becomes:

$$S^* = S(\ell, \cdot) = p\ell + f^D + t - p\frac{Q(\ell)}{q(\ell)}.$$

Since the defendant's offer is a function of acceptance level ℓ, we have

$$\frac{dS^*}{d\ell} = q'(\ell)p\frac{Q(\ell)}{q^2(\ell)}. \tag{10}$$

Then, the effect of insurance on the defendant's settlement offer is given by:

$$\Delta S = S^S - S^I = \int_{\ell^{PI}}^{\ell^{PS}} q'(\ell)p\frac{Q(\ell)}{q^2(\ell)}d\ell. \tag{11}$$

Result 3. *The defendant will make a lower (higher) settlement offer to the insured plaintiff than to the self-funded plaintiff if the loss distribution is convex (concave).*

Note that q' is determined by the distribution of accident loss. One might plausibly assume that most plaintiffs suffer small losses while few suffer large losses, so that the distribution of accident losses is skewed to the right and $q' < 0$ over the relevant range. In this case, the defendant will make a higher settlement offer to the insured compared with the self-funded plaintiff ($\Delta S < 0$). If the loss distribution is uniform ($q' = 0$), insurance has no effect on the defendant's settlement offer.

3.3 Settlement probability

Since insurance influences the settlement offer, it affects the plaintiff's acceptance level as well. Substituting S^S and S^I into (2) and (3), the acceptance level between self-funded and insured becomes:

$$\Delta\ell^* = \ell^{PS*} - \ell^{PI*} = \lambda\frac{\Delta S}{p} + \Delta\ell. \tag{12}$$

It is clear that the settlement probability $Q[\ell^*(S^*, \cdot), \cdot]$ is affected by the acceptance level directly and settlement offer indirectly. From (7) we know $\Delta\ell > 0$, therefore we have

Result 4. *The effect of insurance on the settlement probability is ambiguous. If insurance reduces the settlement offer ($\Delta S > 0$), this decreases the settlement probability ($\Delta\ell^* > 0$).*

The above result illustrates that if most plaintiffs suffer large losses whilst a few suffer small losses ($q' > 0$), insurance will reduce the settlement probability. However, if most plaintiffs suffer small losses whilst a few suffer large losses ($q' < 0$), the result is ambiguous. When $|q'|$ is big enough, there exists a regime where the the insurance's effects on settlement offer ΔS offsets its effects on acceptance level $\Delta\ell$, therefore $\Delta\ell^* < 0$. If so, insurance does increase settlement probability. Comparing this result with Result 2, we conclude that when considering reactions of the defendant the assertion of insurance reducing settlement probability is not sufficient. These also imply that welfare comparisons may be ambiguous because, depending on the distribution of the accident loss, the defendant can either increase or decrease his settlement offer. Therefor, in the discussion section, we will examine the uniform distributed loss as an example.

The intuition behind the analysis is interesting. Asymmetric information will generally result in some degree of inefficiency in the bargaining process. The extent of inefficiency is related to the nature of the distribution of the information. As suggested by literature, because the plaintiff's private information can not be credibly passed to the defendant without a cost being incurred by the plaintiff via the signaling of the information, the plaintiff can be harmed by asymmetric information. Moreover, since the strategic role of insurance encourages the plaintiff's rant seeking, without considering the defendant's reaction, an insured plaintiff has a higher acceptance level than a self-funded plaintiff.

3.4 Accident probability

Before we move to the defendant's care decision, it is instructive to investigate the efficient level of care.[8] In the context of litigation, the efficient level of care is defined as the care level which maximises the net welfare of both the plaintiff and the defendant. We assume the litigants are equally weighted in the social welfare, therefore the net social welfare function is:[9]

$$U = y_P + y_D - x - \pi(x)\{L + f^D + Q(\ell)f^S + [1 - Q(\ell)][pf^w + (1-p)f^0]\}$$

To maximise the social welfare, the social efficient care level x^s is given by

$$\pi'(x^s) = -\frac{1}{L + f^D + Q(\ell)f^S + [1 - Q(\ell)][pf^w + (1-p)f^0]}$$

From the above equation, we can find that the litigants' initial incomes y_P and y_D do not have impacts on x^s. This implies that rich or poor does not affect the social efficient level of care. Moreover, since $0 < Q(\ell) < 1$, $0 < p < 1$ and $f^0 \leqslant f^w$, the sign of $\pi'(x^s)$ is always negative, which means accidents can be reduced by increasing care level. Again, the value of the efficient care level can be solved only when both the specific fee arrangement (f^0 and f^w) and the accident probability function (π) are given.

Now, we consider the defendant's care decision and its effect on accident probability. The defendant chooses his expenditure on care x to maximise his *ex ante* welfare, which is given by:

$$W_D = [1 - \pi(x)](y_D - x) + \pi(x)(y_D - x - H^*)$$

where H^* is the defendant's minimised post-accident cost: $H^* = Q(\ell)S^* + [1 - Q(\ell)](f^D + t) + p\int_{\ell}^{L_1} LdQ$.

Assume his optimal care x^* is positive, it satisfies

$$-1 - \pi'(x)H^* = 0$$

[8]The formal definition of the efficient level of care can be found in Calabresi (1970). Calabresi points out that, to calculate the efficient level of care, the cost of care, the cost of inefficient risk allocation and the cost of litigation need to be considered. We do not consider the cost of inefficient risk allocation in this chapter since we assume all players are risk neutral.

[9]By assuming the market is competitive, the roles of the insurer and the lawyers are ruled out in the social welfare function (their incomes equal their costs).

and is obviously increasing in H^*. In addition, the relationship between the defendant's *ex post* cost H^* and the plaintiff's acceptance level is given by:

$$\frac{dH^*}{d\ell} = q(\ell)(S^* - p\ell - f^D - t).$$

From (9), in equilibrium since $Q(\ell) > 0$ we know that $S^* - p\ell - f^D - t < 0$, therefore $\frac{dH^*}{d\ell} < 0$. Now it is clear that x is decreasing in ℓ. Since the insured plaintiff and self-funded plaintiff may have different settlement offers and different acceptance levels, we have:

Result 5. *The defendant's care level increases if and only if the insurance reduces the plaintiff's acceptance level. Furthermore, if insurance reduces the settlement offer, this reduces accident probability.*

Combining the above result with Result 2, we find that given the defendant's settlement offer, insurance increases the care level and therefore reduces accident probability.

As is in other litigation models (see Gravelle & Waterson (1993), van Velthoven & van Wijck (2001) and Heyes et al. (2004)), the defendant's *ex post* welfare is increased when a given settlement offer is more likely to be accepted and this is the same for his *ex ante* welfare. Therefore, the defendant is better off if and only if $\Delta\ell^* < 0$. If the distribution $q' < 0$, as we mentioned in the last subsection, there is a regime where the defendant will be better off if the plaintiff is insured.

3.5 Welfare: BTE, ATE and Self-funded

Assume the insurance premiums are actuarially fair. The insurance premiums are equal to the insurer's payment at trial:

$$\alpha_A = [1 - Q(\ell^{PI*})][pf^w + (1-p)f^0 - t].$$

$$\alpha_B = \pi[1 - Q(\ell^{PI*})][pf^w + (1-p)f^0 - t].$$

The *ex post* welfare of an ATE insured plaintiff is:

$$W^p_{IA} = y_P - L - \alpha_A + Q(\ell^{PI*})(S^I - f^S) + p\int_{\ell^{PI*}} LdQ,$$

where y_P is the plaintiff's income if no accident. The *ex post* welfare of BTE insured plaintiff is:

$$W^p_{IB} = y_P - L - \alpha_B + Q(\ell^{PI*})(S^I - f^S) + p\int_{\ell^{PI*}} LdQ,$$

The *ex post* welfare change between these two is:

$$W^p_{IA} - W^p_{IB} = -(1-\pi)(1-Q)[p(1-k)f^w + (1-p)(f^0 + kf^D)] < 0. \quad (13)$$

Compared with ATE, the risk neutral plaintiff has higher *ex post* welfare if he purchases BTE. The reason for this is that BTE has a lower insurance premium.

The ATE plaintiff's *ex ante* welfare is given by:

$$W^a_{IA} = (1-\pi)y_P + \pi W^p_{IA}.$$

As we have shown that the plaintiff's acceptance levels are the same under ATE and BTE, the accident probability π is the same for BTE and ATE as well. We can write the BTE plaintiff's *ex ante* welfare as:

$$W^a_{IB} = (1-\pi)(y_P - \alpha_B) + \pi W^p_{IB}.$$

The change of *ex ante* welfare is:

$$W^a_{IA} - W^a_{IB} = (1-\pi)y_P - (1-\pi)(y_P - \alpha_B) + \pi(W^p_{IA} - W^p_{IB})$$

Since $W^p_{IA} - W^p_{IB} = \alpha_B - \alpha_A$, we have

$$W^a_{IA} - W^a_{IB} = \alpha_B - \pi\alpha_A = 0 \tag{14}$$

For the defendant, his welfare only changes with the plaintiff's acceptance level. Since the acceptance levels keep the same whatever the type of insurance, the defendant's welfare is the same across ATE and BTE. Therefore, the change of social welfare is only affected by the plaintiff's welfare change. We conclude:

Result 6. *In a competitive insurance market, the plaintiff's ex ante welfare and the defendant's ex ante and ex post welfare does not change across ATE and BTE. However, the plaintiff has higher ex post welfare under BTE.*

When the insurance is unavailable, the plaintiff's *ex post* welfare is:

$$\begin{aligned} W^p_{PS} = y_P - L + Q(\ell^{PS*})(S^S - f^S) + p\int_{\ell^{PS*}} LdQ \\ -[1 - Q(\ell^{PS*})][pf^w + (1-p)f^0 - t]. \end{aligned}$$

Comparing this with ATE, we get:

$$\begin{aligned} W^p_{IA} - W^p_{PS} = Q(\ell^{PI*})(S^I - f^S) - Q(\ell^{PS*})(S^S - f^S) - p\int_{\ell^{PS*}}^{\ell^{PI*}} LdQ \\ +[Q(\ell^{PI*}) - Q(\ell^{PS*})][pf^w + (1-p)f^0 - t]. \end{aligned}$$

The first two terms above are insurance's effect on settlement. As we showed before, the difference between the settlement offers $(S^S - S^I)$ depends on the distribution of accident loss. The difference between the acceptance levels $(\ell^{PI*} - \ell^{PS*})$ partly depends on $(S^S - S^I)$. The integral term reflects the effect of insurance on the trial compensation. The last term is the risk of trial: refusing to reach a settlement may incur higher legal cost.

Clearly, much depends on the loss distribution. If $q' > 0$, which means most plaintiffs suffer large losses whilst a few suffer small losses, since $S^S > S^I$ and

$\ell^{PS*} > \ell^{PI*}$, we have $Q(\ell^{PI*})(S^I - f^S) - Q(\ell^{PS*})(S^S - f^S) < 0$, $p\int_{\ell^{PS*}}^{\ell^{PI*}} LdQ < 0$ and $[Q(\ell^{PI*}) - Q(\ell^{PS*})][pf^w + (1-p)f^0 - t] < 0$. The sign of $W^p_{IA} - W^p_{PS}$ is ambiguous. Insurance imposes a positive gain from the trial compensations, but reduces the probability of settlement and increases the risk of costly legal fees at trial. Only when its gain offsets these negative effects, does ATE produce higher *ex post* welfare. If the loss distribution is uniform, $q' = 0$, where $S^S = S^I$ and $\ell^{PS*} > \ell^{PI*}$, we get the same result. If $q' < 0$, where $S^S < S^I$, there are three regimes: $\ell^{PS*} > \ell^{PI*}$, $\ell^{PS*} = \ell^{PI*}$ and $\ell^{PS*} < \ell^{PI*}$. Only in the regime of $\ell^{PS*} = \ell^{PI*}$, is $W^p_{IA} - W^p_{PS} > 0$. In other regimes, the results are still ambiguous.

The intuition behind the analysis is interesting. Asymmetric information will generally result in some degree of inefficiency in the bargaining process. The extent of inefficiency is related to the nature of the distribution of the information. As suggested by literature, because the plaintiff's private information can not be credibly passed to the defendant without a cost being incurred by the plaintiff via the signaling of the information, the plaintiff can be harmed by asymmetric information. Moreover, since the strategic role of insurance encourages the plaintiff's rant seeking, an insured plaintiff has a higher acceptance level than a self-funded plaintiff.

The self-funded plaintiff's *ex ante* welfare is:

$$W^a_{PS} = [1 - \pi(\ell^{PS*})]y_P + \pi(\ell^{PS*})W^p_{PS}.$$

Then, the *ex ante* welfare change between ATE and self-funded is given by:

$$W^a_{IA} - W^a_{PS} = [\pi(\ell^{PS*}) - \pi(\ell^{PI*})]y_P + \pi(\ell^{PI*})W^p_{IA} - \pi(\ell^{PS*})W^p_{PS}$$

The comparison is ambiguous. If insurance reduces the acceptance level, so the accident probability is reduced. A positive gain in *ex ante* income comes from the comparison: $[\pi(\ell^{PS*}) - \pi(\ell^{PI*})]y_P > 0$. But the sign of $\pi(\ell^{PI*})W^p_{IA} - \pi(\ell^{PS*})W^p_{PS}$ is not clear. Only in the regime $\ell^{PS*} = \ell^{PI*} : (q' < 0)$, do we have $W^a_{IA} - W^a_{PS} > 0$.

Using Result 6, we find that the comparisons between BTE and self-funded will have the similar results. The welfare comparisons are ambiguous as well. Only in the regime $\ell^{PS*} = \ell^{PI*} : (q' < 0)$, does BTE have obviously higher welfare both *ex ante* and *ex post* for the plaintiff.

4 Discussions

4.1 Recoverable ATE premium

Now we look into a situation that the ATE premium (α_A) are recoverable by the defendant if the plaintiff wins. This is the position in England and Wales posterior to 2000.

The plaintiff will accept the defendant's settlement offer only when:

$$S - f^S \geqslant p(L + \alpha_A).$$

Using the same method of Section 3, we have:

$$\ell^{PI*} - \ell^{PIR*} = \lambda \int_{\ell^{PI}-\alpha_A}^{\ell^{PI}} q'(\ell)\frac{Q(\ell)}{q^2(\ell)}d\ell. \tag{15}$$

where ℓ^{PIR*} is the acceptance level of the recoverable ATE plaintiff. The sign of the above equation still depends on the loss distribution. If the loss distribution is convex/concave the plaintiff has higher/lower acceptance level under the unrecoverable ATE insurance.

The intuition behind this is clear: if the ATE insurance does not recover the plaintiff's insurance premium, the plaintiff's initial acceptance level (without considering the defendant's action) will become higher. However, the defendant's settlement offer will also change become he has less costs if he loses the trial. The overall effects depend on the defendant's appreciation of the loss.

Under the recoverable ATE insurance, the defendant's *ex ante* welfare is:

$$W_D^a = [1-\pi(x)](y_D - x) + \pi(x)(y_D - x - H_R^*) = y_D - x - \pi(x)H_R^*.$$

Since the accident probability π is affected by the acceptance level ℓ through x, the defendant's *ex ante* welfare can either increase or decrease when the acceptance level increases. This depends on the specific accident probability function π. Therefore, the comparison between the defendant's *ex ante* welfare is ambiguous.

We now go to the plaintiff's welfare. The *ex post* welfare difference between the unrecoverable and recoverable ATE insurance is

$$\begin{aligned} W^p_{PI*} - W^p_{PIR*} &= [Q(\ell^{PI*}) - (1-p)Q(\ell^{PIR*}) - p][pf^w + (1-p)f^0 - t] \\ &+ Q(\ell^{PI*})(S^{PI} - f^S) - Q(\ell^{PIR*})(S^{PIR} - f^S) + p\int_{\ell^{PI*}}^{\ell^{PIR*}} L dQ \end{aligned}$$

Since the sign of $\ell^{PI*} - \ell^{PIR*}$ depends on the loss distribution, the welfare comparison remains ambiguous. In the next subsection, we will analyze the plaintiff's welfare under some special situations: the uniform distribution.

4.2 Uniform distribution

Given the ambiguous welfare effects, we now consider the effects a specific loss distribution: the uniform distribution. If the loss distribution is uniform, assuming $L_0 = 0$ we can write the probability function of settlement Q and its density function q as:

$$Q = \frac{L}{L_1} \quad , \quad q = \frac{1}{L_1}.$$

Unrecoverable ATE insurance

We start with the unrecoverable ATE insured and the self-funded plaintiff (Section 3). Since now $q' = 0$, $\Delta S = 0$. (12) becomes:

$$\Delta\ell^* = \Delta\ell = \lambda\frac{pf^w + (1-p)f^0 - t}{p}.$$

Accordingly, the *ex post* welfare difference between the ATE and the self-funded plaintiff becomes

$$W^p_{IA} - W^p_{PS} = -p\frac{\Delta\ell}{L_1}\frac{\Delta\ell}{2} < 0 \tag{16}$$

Using Result 6, we have:

Corollary 1. *If the loss is uniform contributed, compared to the BTE insurance and the self-funding, the plaintiff has lowest* ex post *welfare under the unrecoverable ATE insurance.*

Since the accident probability function π is not given. The *ex post* welfare comparison between the BTE insurance and the self-funding and *ex ante* welfare comparisons are still ambiguous.

Recoverable ATE insurance
We now compare the unrecoverable ATE insurance with recoverable ATE insurance. Under the uniform distribution, since $q' = 0$, $\ell^{PI*} = \ell^{PIR*}$. The *ex post* welfare comparison becomes:

$$W^p_{PI*} - W^p_{PIR*} = Q(\ell^{PI*})(S^{PI} - S^{PIR}) - p[1 - Q(\ell^{PI*})][pf^w + (1-p)f^0 - t] \tag{17}$$

Since $S^{PI} < S^{PIR}$, we have:

Corollary 2. *If the loss is uniform contributed, compared to the unrecoverable ATE insurance, the plaintiff has higher* ex post *welfare under the recoverable ATE insurance.*

5 Summary and conclusions

In this paper, we initiated the research of effects of the BTE and the ATE legal expenses insurance. We found that given the defendant's settlement offer, the insured plaintiff has a lower settlement probability. This confirmed the results of early literature (e.g. Heyes et al. (2004)). However, when considering the defendant's interaction, the effects of insurance on the settlement probability is ambiguous. This is because the distribution of the accident loss plays an important role in the defendant's settlement offer. When the distribution of the accident loss is convex (concave), the defendant will make a lower (higher) settlement offer to the insured plaintiff than to the self-funded plaintiff. Also, insurance increases the defendant's care level if and only if it reduces the plaintiff's acceptance level. Thus, when insurance reduces the settlement offer, it reduces care and increases the accident probability.

In the discussion section, we first look into the case of recoverability of insurance premium. To remove some ambiguities, we also examined the uniform distribution. In this case, we found that the ATE plaintiff has a lowest *ex post* welfare.

However, as in other research on fees and litigation, a number of our results imply ambiguity in the comparisons, especially these welfare results. This reflects a fundamental complexity in the underlying relationship we model but, for this reason, such ambiguity should not be ignored: policy needs to be carefully considered, with suitable opportunities or empirical evaluation.

Appendix:

Proof of Result 1

(1) Since the lawyer's gain from settlement is given by $G^A = f^S - pf^w - (1-p)f^0 + c_1$, we note that $G^A_S = 0$, $G^A_L = 0$ and $G^A_p = f^0 - f^w \leqslant 0$. First, for the self-funded plaintiff $G^{PS}_S = 1$, $G^{PS}_L = -p$ and $G^{PS}_p = -L+(1-k)f^w - f^0 - kf^D$. We find that $\partial\ell/\partial S = 1/p$ and $\partial\ell/\partial p = \{-\lambda L + (1-\lambda)(f^0 - f^w) + \lambda[(1-k)f^w - f^0 - kf^D]\}/\lambda p$. Then, for the insured plaintiff, using the same method we have $\partial\ell/\partial S = 1/p$ and $\partial\ell/\partial p = [-\lambda L + (1-\lambda)(f^0 - f^w)]/\lambda p$. (2) From (1) we have $\partial\ell/\partial p < 0$. Note that $f^0 - f^w < 0$. Under the English cost rule $(1-k)f^w - f^0 - kf^D < 0$, therefore the self-funded plaintiff has a steeper $\partial\ell/\partial p$. (3) In both situations, G always contains f^0, f^w and f^D whatever weight and cost shifting rules.

References

Baik, K. H. & Kimb, I.-G. (2007), 'Contingent fees versus legal expenses insurance', *International Review of Law and Economics* **27**, 351–361.

Calabresi, G. (1970), *The Cost of Accidents: A Legal and Economic Analysis*, Yale University Press.

Gravelle, H. S. E. (1993), 'The efficiency implications of cost-shifting rules', *International Review of Law and Economics* **13**, 3–18.

Gravelle, H. S. E. & Waterson, M. (1993), 'No win, no fee: Some economics of contingent legal fees', *The Economic Journal* **103**(420), 1205–1220.

Heyes, A., Rickman, N. & Tzavara, D. (2004), 'Legal expenses insurance, risk aversion and litigation', *International Review of Law and Economics* **24**, 107–119.

Kirstein, R. (2000), 'Risk-neutrality and strategic insurance', *The Geneva Papers on Risk and Insurance. Issues and Practice* **25**(2), 251–261.

Reinganum, J. F. & Wilde, L. L. (1986), 'Settlement, litigation, and the allocation of litigation costs', *RAND Journal of Economics* **17**(4), 557–566.

van Velthoven, B. & van Wijck, P. (2001), 'Legal cost insurance and social welfare', *Economics Letters* **72**, 387–96.