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# Informational Externalities and Settlements in Mass Tort Litigations

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**Abstract**

This paper elaborates on a basic model of mass tort litigation, highlighting the existence of positive informational externalities afforded by the discovery process (as a general technology of production of evidences) in order to study when a class action is formed, or when a sequence of individual trials is more likely. We illustrate the argument that when several plaintiffs file individually a lawsuit against the same tortfeasor, the resolution of the various cases through repeated trials produces positive informational externalities. When class actions are forbidden, these externalities only benefit to the later plaintiffs (through precedents, jurisprudence...). When they are allowed, the first filers may have an incentive to initiate a class action as far as it enables him to benefit from these externalities, through the sharing of information with later filers. We provide sufficient conditions under which a class action is formed, assuming a perfect discovery process. We also show that when contingent fees are used to reward attorneys' services, plaintiffs become neutral to the arrival of new information on their case.

KEYWORDS: Mass Tort Class Action, information sharing, repeated litigation, contingent fees.

## 1 Introduction

Informational asymmetries are considered as an important factor to explain the strategies of litigants to solve legal conflicts. However, when parties enter into the litigation process, they collect evidences, testimonies, expertises and share many informations during the pretrial negotiation period. Moreover, when there

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is a collective concern, plaintiffs do not enter simultaneously into the litigation process but rather sequentially, at different dates. This is the case, for instance, when victims are injured by the same tortfeasor in a quite long period of time (e.g. asbestos or tobacco litigation, medical malpractice or product liability). It follows that some informations of the "first movers" benefit to the other, since as time is passing, new evidences arrive and the "state of the art" changes. As a result, some uncertainty is resolved from the time the first claims are solved to the period the later plaintiffs file. This implies positive informational externalities between plaintiffs because later fillers benefit from the experience of the first plaintiffs. These externalities also allow later plaintiffs to update their beliefs on the likelihood to win at trial. According to this view, class actions may be understood as a device which allows plaintiffs to internalize informational externalities. Specifically, class actions allow the earlier victims to retain part of the benefits of these externalities, that they would otherwise never recover. As a consequence, when they participate to a class actions, plaintiffs perceive in a better way the existence of the correlation between the individual losses. In other words, plaintiffs would become more confident with their chances of success at trial against the same defendant. An additional argument is that the class action's lawyers certainly contribute to the transmission of information between the members.

In the existing literature on the economics of class actions, it is more usual to find arguments regarding the opportunistic/strategic behaviours of one of the three parties involves in mass tort litigation (plaintiffs, defendants or their attorneys) as a result of the existence of informational asymmetries. A specific line of research has discussed the existence of, and solution to, agency problems between attorneys and their clients. The main issue is how to monitor the effort undertaken by attorney for the time they spend to their clients' case, and give them efficient incentives to maximize their client's recovery. In particular, the rational for the use of contingent fees (Klement and Neeman (2004), Lynk (1990,1994), Miceli and Segerson (1991)), or conditional fees (Emons (2006,2007), Emons and Garoupa (2006)), has been assessed.

Some authors have been more concerned with the relationships between plaintiffs as members of a class action. Che (1996) for example analyzes the role of asymmetries of information on the one hand between plaintiffs and the defendant, and on the other hand between the members of the class action. Che assumes that two kinds of plaintiffs (small claim, and large claim) sue against the same tortfeasor, and have the opportunity to join a class action or to file individually. He finds a multiplicity of equilibria: either no class action is formed, while there exists a potentially viable class action, or not all the plaintiffs are allowed to join the class action (and specificlass actionlly, not all the smallest or weakest victims), but many opt out. Marceau and Mongrain (2003) for their own develop the idea that a class action has the characteristics of a public good, although it is privately produced - since a class action is usually provided by only a subset of plaintiffs. Once the class action is created against a tortfeasor, all the victims have the opportunity to join it, and thus benefit from the provision of the good without having to incur the initial cost associated to the formation of the class action. For the representative member, this cost is a sunk cost, and it is borne only by the initiator of the class action. Hence, there is a problem of "free-riding", which is formalized by Marceau and Mongrain as a war of attrition: on the one hand, each plaintiff has an incentive to wait that someone else initiates the class action (because of the sunk cost) but on the second, he bears a penalty in waiting (time is also costly). The authors mainly demonstrate that the identity of the class action initiator depends on the rule of compensation awarded by courts to the class action members: small levels of damage averaging tend to give incentives to the holder of the smallest claim to be the initiator of the class action.

A more recent line of research addresses the issue of the deterrent effects of group versus individual litigation on the injurer's misconduct. Saraceno (2008) illustrates that group litigation does not always improve deterrence. Despite the fact that group litigation facilitates access to justice for victims (through the benefits of scale economies and/or the improvement of their confidence in a trial), it creates additional transaction costs borne by victims. Moreover, the aggregation of individual cases thanks to a group litigation enables the injurer to reduce its liability costs, since it both facilitates settlement and reduces litigation costs. The combined result of these various effects might be a reduction, rather than an increase, in the deterrent effect of tort law. Deffains and Demougin (2010) findings are more favourable to the deterrence effect of group litigation, relying on a different argument. They assume that firms have intrinsic motivations (such as feelings of remorse, guilt, regret and/or shame). They show that the standard aggregation argument in favor of class action holds, increasing efficiency due to lower litigation costs. In the short run intrinsically motivated firms benefit from the introduction of a class action procedure. In the long run, new intrinsically motivated entrants are attracted in the market thereby increasing consumer surplus. Overall, the average care level increases.

In the present paper, no asymmetric information exist between litigants, and parties are unable to anticipate *ex-ante* the behavior of the court during the trial. We rather focus on the impact of information sharing between plaintiffs and we compare the case where class actions are forbidden to the case where they are allowed. In many countries, procedural rules hold such that parties have a free access to the evidences and the various documents that the other party has gathered and will produce at trial. However, uncertainty remains as to the outcome at trial given the existence of an heterogeneity in the decisions of courts, concerning similar cases. A related problem is the emergence of new legal doctrines. For example in the United States, the problem with the asbestos litigation in the eighty's comes partly from the fact that the legal doctrines to apply was not yet developed. So in our work, the main source of uncertainty is coming from the behavior of the courts.

We consider a situation where a given agent, for example through the occurrence of several successive individual accidents, injures a group of victims. If class actions are forbidden, victims will individually enter into the litigation process filing against the same tortfeasor according to a sequence of moves which is supposed exogeneously given[1]. It follows that repeated trials entail positive informational externalities which are beneficial only to the later plaintiffs. The earlier ones who are less informed may undertake strategies that otherwise they would not choose to adopt with a better information. In contrast, the plaintiffs who enter later on in the litigation process may benefit from the experience of the earlier ones and are allowed to undertake more accurate decisions regarding the various legal options that are available (file or exit, go to trial, settle or give up).

This is a passive transmission of information coming from the earlier plaintiffs, but a problem arises because the first plaintiffs have no means to benefit of the information collected by their successors or to retain privately part of the benefits associated to the positive informational externality they create. From this perspective, the formation of a class action may be understood as a tool to internalize these externalities. More generally, the formation of a class action makes easier the transmission of information between the plaintiffs. As a consequence, apart of economies of scales coming from the pooling of lawyer's services, we identify a new rationale to the formation of class actions which result from information sharing between plaintiffs. Specifically, the pooling of individual information allows all of them to improve their individual assessment of the expected gain at trial. We focus on these incentives to share information between plaintiffs suing the same tortfeasor and we investigate their consequences for the existence of a class actions.

The paper develops as follows. Section 2 presents the model. Section 3 derives the market equilibrium under different institutional frameworks (sequential trial, information sharing). Section 4 discusses the specific issue with contingent fees, and section 5 concludes. Proofs of propositions are in the appendix unless statements are obvious from the text.

# 2 The model

## 2.1 The sequence of individual decisions

We consider a three-stage game, where plaintiffs enter sequentially in the litigation process against the defendant, such that $P_i$ is the first filer. In stage 1, $P_i$ may choose between two options: either he files or he exits. In this last case, everything is over for him, and then, $P_j$ has only to decide for himself whether he enters and files individually, or if he exits. If $P_i$ opts for filing, two options are available to him: either he can sue individually, or he can decide to initiate a CA, to which every individuals that have suffered a damage may join. In stage

[1] We were not aware of the existence of a recent contribution related to ours, *i.e.* Daughety and Reinganum (2009), until we prepared the final draft of the present paper. Two noticeable differences in assumptions exist: in Daughety and Reinganum's paper, each plaintiff has private information about damages, and the timing of plaintiffs moves is endogenous. Finally, Daughety and Reinganum give a more comprehensive analysis of the possible equilibria, including defendants' use of preemptive settlement strategies.

2 beginning after $P_i$'s move, $P_j$ chooses either to sue individually or to register to become a member of the class action.

We assume that the membership is voluntary and open, such that the presence of a class action does not legally compel other plaintiffs to join it, and no individual plaintiff is denied membership against his wishes. In practice, Courts decide to maintain a class action or not, and prescribe deadlines for claimants' participation or opt out decisions. This framework reflects the equilibrium behaviors of plaintiffs, in such a way that after a limited period of time during which any individual has the opportunity to opt out, the membership becomes binding: no class action member can opt out, and no new plaintiff can opt in. Moreover, once a class action is formed, which is requiring that more than one plaintiff register, it sues on behalf of all its members. Here, no difference is made between the case where the representative plaintiff who has initiated the class action litigates for all members, or the case where the active role is played by the class action's lawyer. We assume that the delegation of the collective negotiation power to one of the member or to a third party leads to no agency problem and does not require any incentive scheme to monitor the efforts of the class action representative agent, who is supposed always to act in the best interest of all its members.

In stage 3, pretrial negotiations may also take place, leading to an amicable settlement of claims rather than their litigation at trial. That is, after that a suit (individual or collective) is brought against the defendant, this one has the opportunity to make a take-it-or-leave-it offer to the other party (individual plaintiff or class action). Thus, either the defendant's offer is accepted (by a plaintiff or the class action), and thus the claim is settled, or it is rejected. In this event, we consider that either the claim goes to trial, or the plaintiff gives up.

As for the court's behavior, it is assumed that the judge awards a compensatory damage equal to the claim of the defendant in case of an individual suit, while he sets the damage obtained by each member of a class action equal to an index of the aggregate merit of the class, which is defined as $\Theta = \alpha\theta_i + (1-\alpha)\theta_j$, with $\alpha \in ]0,1[$ being either the proportion of plaintiffs $i$ in the population of filers, or an parameter of the discretion power of judges. The role of this rule of damage averaging is part of the present paper, and the distinction between those possible explanations will be discussed in the last part of the paper.

The individual outcomes depend on the various litigation expenditures incurred by the plaintiff, since filing a suit is a costly activity. When filling an individual suit both plaintiffs bear the same litigation costs, which are of two kinds. The first one corresponds to the administrative registration of the claim, $C > 0$, which is supposed to be a sunk cost: whatever his decision, either he maintains his action until it is settled through a negotiation with the defendant or at trial, or he gives up after registration, the plaintiff never recovers this expenditure. The second one, $C_p > 0$ , corresponds to litigation costs *per se* such as attorney fees, auditing or expertise costs and so on, that are borne only when the plaintiff files, to produce evidences in order to strengthen the court's beliefs that the defendant is liable. In contrast, joining a class action allows plaintiffs to litigate for smaller individual costs, $K_p > 0$. Moreover, members of the class action incur an additional sunk cost $K > 0$ (corresponding to registration costs and various administrative costs). We assume that:

**Assumption 1:** $\theta_j > \theta_i > C_p$

**Assumption 2:** $0 < K_p < C_p$, and $0 < K < K_p$

which means that if a plaintiff were aware of the defendant's liability, he would be prone to sue individually. Notice that the conditions of assumption 2 put on the various transaction costs simply insures that a class action entails scales economies on the various litigation costs: $C + C_p > K + K_p$. Scales economies achieved through the pooling of attorney's services and the decrease in the number of plaintiff's individual appearances in front of the court, are a classical motive to explain the great appeal of class actions.

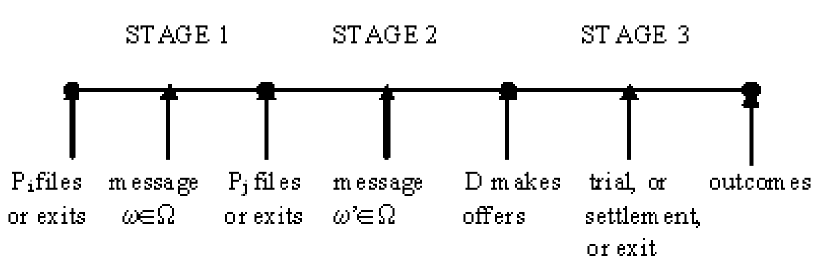
The definition of the nature of both kinds of costs are introduced for ease of exposition. The clue of the story is coming from the distinction between an entry cost which is paid in order that the plaintiff have an access to the litigation process, on the one hand, and a cost paid only when the plaintiff continues his suit until the end at trial, on the second. Notice that a more sensible interpretation would consider that $C$ as $K$ correspond both to administrative costs *per se* coming from the registration of the claim in from of the court plus the various sunk costs associated to the use of attorney's counsels (fixed costs such as filing costs, including expertise expenditures) during the pretrial period, whereas $C_p$ as $K_p$ would include more strictly only the expenditures incurred by the plaintiff when his case goes to trial, for instance those corresponding to the lawyer fees.

Finally, we assume that the rate of impatience is null for all agents.

### 2.2 The technology of information and beliefs updating rules

In our set up, as the plaintiffs enter sequentially in the litigation process, the timing of information arrival is stylized as follows:

Figure 1



We consider circumstances where all the information which may be obtained (the set of all possible messages) by $P_j$ is the same as what is available for the former $P_i$. Thus, everything goes as if the messages successively obtained by the litigants were initially drowned in the same set of messages[2]. But, basically, although both plaintiffs have access to the same technology of information, they have not the ability to update their initial beliefs using the same information: plaintiff $P_i$ enters first and only observes his own message, while plaintiff $P_j$ observe a combination of two messages, consisting in his own message and plaintiff $P_i's$ personal message.

In order to describe the technology of information, we retain a specification in terms of joint probabilities which may appear as poorly intuitive. Nevertheless, this is the more general and straightforward way, since we are more interested with the benefits associated with the process of beliefs updating allowed by this technology, than on the distortions coming from difference between pure individual subjective priors. Anyway, any service of messages reveals the existence of such a joint probability distribution (see Hirschleifer and Riley (1997), Laffont (2000) for the basic case of an unidimensional technology of information). Formally, let us denote $\Omega$ the set of all available messages providing some piece of evidence with respect to the liability or guiltiness of the defendant. When the $P_i$ (respectively $P_j$) pays the litigation costs, he receives a message $\omega$ (respectively $\omega'$) randomly picked in $\Omega$, which will be used to improve his assessment of the likelihood that the defendant will be found liable/not liable at trial. Since we consider the case of an aggregate technology of information, let us take as a primitive the joint probability distribution $P : S \times \Omega \times \Omega \to [0, 1]$, where $S = \{L, NL\}$ is the set of relevant states of the nature regarding the status of the defendant (Liable, Non liable); $p(L, \omega, \omega') \geq 0$ is the likelihood that the defendant is liable and the messages obtained respectively by plaintiffs $i$ and $j$ are $(\omega, \omega')$, while $p(NL, \omega, \omega') \geq 0$ is the likelihood that the defendant is non liable and the messages obtained respectively by $P_i$ and $P_j$ are $(\omega, \omega')$.

We have to consider the various probabilities which are relevant in order to describe the informational status of plaintiffs, at each stage of the litigation process. Specifically, our general assumption implies that individuals have common priors, but that beliefs updating allows them to have different posteriors.

First, the primitives are connected to the plaintiffs' common priors on the defendant's liability in a simple way:

$$\begin{aligned} p_L &= \sum_{(\omega,\omega')\in\Omega^2} p(L, \omega, \omega') \\ p_{NL} &= \sum_{(\omega,\omega')\in\Omega^2} p(NL, \omega, \omega') \end{aligned}$$

Using the available technology of information, the plaintiffs are also allowed to assess their chances to obtain additional information. For example:

[2] Thus, under some circumstances, plaintiff $j$ may receive exactly the same message as plaintiff $i$: the weight of evidence or the significance of the message is increased in such a case.

$$p^i(\omega) = \sum_{\omega' \in \Omega} p(L, \omega, \omega') + \sum_{\omega' \in \Omega} p(NL, \omega, \omega')$$

represents $P_i$'s individual priors to obtain an individual message, when the message obtained by the other plaintiff is not observable. In our set up, where $P_j$ files after $P_i$, we are interested by the case where $P_j$ has the opportunity to observe also the message previously obtained by $i$; hence, the probability of such an event according to the technology of information at hand is:

$$p^j(\omega, \omega') = p(L, \omega, \omega') + p_{NL}(\omega, \omega')$$

As a consequence, $P_j$ will update his beliefs according to the rule:

$$(R1) : p^j(L|\omega, \omega') = \frac{p(L, \omega, \omega')}{p(L, \omega, \omega') + p(NL, \omega, \omega')}$$

when he observes both his own message and the message of the other plaintiff, but $P_i$ can only condition his revision of beliefs on a unique message according to the rule:

$$(R2) : p^i(L|\omega) = \frac{\sum_{\omega' \in \Omega} p(L, \omega, \omega')}{\sum_{\omega' \in \Omega} p(L, \omega, \omega') + \sum_{\omega' \in \Omega} p(NL, \omega, \omega')}$$

with:

$$p(L, w) = \sum_{\omega' \in \Omega} p(L, \omega, \omega')$$

In this context, the possible evidences that may be gathered during the discovery process does not change after that $P_i$ eventually files and before $P_j$ decides to enter. Nevertheless, $P_j$ may benefit of the message obtained by $P_i$ (he benefits of the efforts undertaken by the former in the discovery process). Thus, he may update his likelihood of success according to both messages.[3]

# 3 Institutional framework and equilibrium

We first introduce as a benchmark model the case of a system allowing only individual suits: thus two repeated trials occur. Then, we introduce the possibility of a class action, plaintiff having the opportunity either to sue individually of to register a class action.

[3]In some circumstances however, $P_j$ may gather an additional information, which is whether the evidence that should have been by the previous plaintiff (even when he only obtained partial information) is or not always available or true. In words, some events previously unbelievable are now available as pieces of evidence, and more specifically are seen as acceptable by Courts (unforseen contingencies).

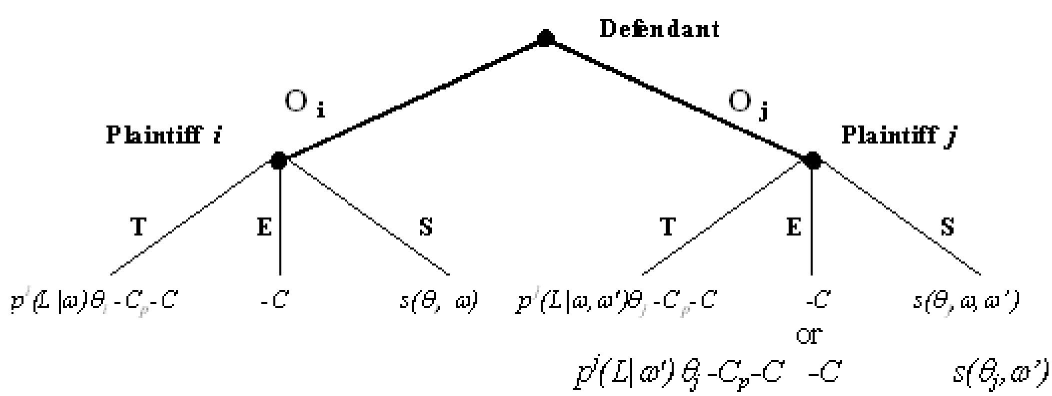
## 3.1 Precedents, repeated trials and pure individual suits

When repeated trials occur ($P$' s case is first settled), the last filer may benefit of the existence of jurisprudence or precedents as a result of a pure informational effect. We investigate how this involuntary sharing of information between plaintiffs affects the individual incentives to file.

Assume that the class action is not allowed as a litigation option: plaintiffs can file only an individual suit. Players' moves in stage 3 are the following: for the defendant, make an individual offer $O_i$ ($O_j$) for plaintiff $i$ (respectively $j$); and each individual plaintiff may choose between: go to trial $T$; exit $E$; settle $S$). Let us denote $s(\theta_i, \omega)$ and $s(\theta_j, \omega, \omega')$ the settlement offer made by the defendant respectively to $P_i$ and $P_j$.

When a case is litigated, any information which is revealed is always shared between the plaintiff and the defendant. In the present set up, the defendant always exercise his rights to the discovery process, since it allows him either to settle for an offer lesser than when the plaintiff is silent, and/or to litigate while saving the trial costs. The following lemma first solves for the efficient decision of the defender and the response of the plaintiffs when the last stage of the game is seen as a "one-shot" bargaining process, exhibited in figure 2:

Figure 2




**Lemma 1** *Consider plaintiffs and defendant's moves in stage 3:*

*i) For any message $\omega \in \Omega$, corresponding to the information obtained by $P_i$, the best "one shot" individual offer made by the defendant to plaintiff $P_i$ is: $s(\theta_i, \omega) = \max\left(0, p^j(L|\omega)\theta_i - C_p\right)$. $P_i$ accepts this offer.*

*ii) For any combination of messages $(\omega, \omega') \in \Omega \times \Omega$, corresponding to the information obtained by $P_j$, the best "one shot" individual offer made by the defendant to plaintiff $P_j$ is $s(\theta_j, \omega, \omega') = \max(0, p^j(L|\omega, \omega')\theta_j - C_p)$. $P_j$ accepts this offer.*

All proofs of the paper are in the appendix. Note that for concreteness, we adopt in the paper the convention that the indifference between trial and settlement amounts to a strict preference for the settlement (see the discussion in Rasmusen (2001), Shavell (1989)).

Coming back to stage 2, $P_j$ evaluates his own opportunity to file or not. Let us denote his expected utility level given the various possible messages that he may receive as follows:

$$Eu_j(\theta_j, p^j(L|.,.)) = \sum_{(\omega,\omega')\in\Omega^2} p^j(\omega,\omega') \max\left(0, p^j(L|\omega,\omega')\theta_j - C_p\right) - C$$

while, conditional on its priors, his expected utility level is:

$$Eu_j(\theta_j, p_L) = p_L\theta_j - C_p - C$$

The following lemma analyses when plaintiff $P_j$ sues or gives up.

**Lemma 2** *i) Assume that only "good news" are expected to arrive; then, information is not worth for $P_j$ i.e.:*

$$\begin{aligned} \text{if } \min\left\{p^j(L|\omega,\omega'),\ \text{for all } (\omega,\omega')\in\Omega\times\Omega\right\} &\geq \frac{C_p}{\theta_j}, \text{ then:} \\ Eu_j(\theta_j, p^j(L|.,.)) &= p_L\theta_j - C_p - C \end{aligned}$$

*ii) Assume that there exists a unique combination of messages $(\hat{\omega},\hat{\omega}')\in\Omega\times\Omega$ such that $p(L,\hat{\omega},\hat{\omega}')\geq\frac{C_p}{\theta_j}$; then, information is worth for $P_j$, i.e. : $Eu_j(\theta_j, p^j(L|.,.)) - Eu_j(\theta_j, p_L)\geq 0$.*

*iii) Assume that there exists at least one combination of messages $(\hat{\omega},\hat{\omega}')\in\Omega\times\Omega$ such that $p(L,\hat{\omega},\hat{\omega}')\geq\frac{C_p+C}{\theta_j}$; then $P_j$ always files individually, i.e. $Eu_j(\theta_j, p^j(L|.,.))\geq 0$.*

Part i) implies that if priors are "optimistic" for $P_j$, then $P_j$ always files, i.e. $p_L \geq \frac{C_p+C}{\theta_j} \Longrightarrow Eu_j(\theta_j, p^j(L|.,.))\geq 0$, but if $p_L < \frac{C_p+C}{\theta_j}$ then the plaintiff gives up ($Eu_j(\theta_j, p^j(L|.,.)) < 0$).

Part ii) means that if priors are "pessimistic" for $P_j$, then $P_j$ may nevertheless file, i.e. we may have $Eu_j(\theta_j, p^j(L|.,.))\geq 0$ although $p_L\leq\frac{C_p+C}{\theta_j}$.

Part iii) means that once there exists a very good news, the plaintiff always prefer to file an individual suit.

The same qualitative results also apply to $P_i$: in stage 1, he evaluates the opportunity to file or not without the knowledge of the relevant message that will be available in the future, but only knowing the set of possible messages afforded by the available technology of information. Let us define by:

$$Eu_i(\theta_i, p^i(L|.)) = \sum_{\omega\in\Omega} p^i(\omega) \max\left(0, p^i(L|\omega)\theta_i - C_p\right) - C$$

his expected utility level associated to the technology of information, and:

$$Eu_i(\theta_i, p_L) = p_L\theta_i - C_p - C$$

his satisfaction level associated to his priors, which are the same as the other plaintiff. Thus, we have:

**Lemma 3** *i) Assume that only "good news" are expected to arrive; then, information is not worth for $P_i$, i.e.:*

$$\begin{aligned} \text{if } \min\left\{p^i(L|\omega),\ \text{for all } \omega\in\Omega\right\} &\geq \frac{C_p}{\theta_i}, \text{ then:} \\ Eu_i(\theta_i, p^i(L|.)) &= p_L\theta_i - C_p - C \end{aligned}$$

*ii) Assume that there exists a unique message $\hat{\omega}\in\Omega$ such that $p(L,\hat{\omega}) \geq \frac{C_p}{\theta_i}$; then, information is worth for $P_i$, i.e.: $Eu_i(\theta_i, p^i(L|.)) - Eu_i(\theta_i, p_L) \geq 0$.*

*iii) Assume that there exists at least one message $\hat{\omega}\in\Omega$ such that $p(L,\hat{\omega}) \geq \frac{C_p+C}{\theta_i}$; then $P_i$ always files individually, i.e. $Eu_i(\theta_i, p^i(L|.)) \geq 0$.*

Considering together lemma 2 and 3, we obtain the conditions under which entering the discovery process is worth to a plaintiff. Information has a positive value in the present context only when litigants know that bad news sometimes may be obtained. With additional information, a plaintiff updates his priors, and he is allowed to undertake the best possible decision in every circumstances, given that he can exercise an exit option if the information learned appears to be unfavorable for his case.

In this sense, the updating of beliefs may explain that holders of nuisance suits or pessimistic victims (conditionally on their priors: *i.e.* $p_L\theta - C_p - C < 0$) have an incentive to file, in the hope to learn good news in the future and pursue until trial their action. In this last case, it depends on stronger conditions on the technology of information. This is highlighted in parts iii) of the lemmas. Each gives a simple sufficient condition required whatever the priors (optimistic or pessimistic) in order to induce a plaintiff to file an individual lawsuit, saying that the plaintiff knows that there exists at least a very favorable message entailing a large probability that the defendant will be seen liable by the court. This last result may be understood as follows: it is not worth that a plaintiff expect to always receive a favorable message in the future; in contrast, in order to induce him to file a suit, it is sufficient that there a single favorable message exists, given that in others circumstances, he will be induced to give up having only paid the administrative sunk costs.

In contrast, part i) of both lemmas shows interestingly enough that when the available (technology of) information does not allow the possibility of bad events or news, such that the plaintiffs expect to obtain a positive payment from the defendant in any future event, then the discovery process provides no additional value in the sense that whether plaintiffs update their priors depending on the new message collected or use their priors, in both cases they undertake the same efficient decision.

Lemmas 1 to 3 lead to the following proposition:

**Proposition 4** *Assume that there exists at least one combination of messages* $(\hat{\omega}, \hat{\omega}') \in \Omega \times \Omega$ *such that* $p(L, \hat{\omega}, \hat{\omega}') \geq \frac{C_p + C}{\theta_i}$*; then there exists a Subgame Perfect Equilibrium where i) each plaintiff file individually, and ii) both cases are settled.*

The requirement that there exists a $p(L, \hat{\omega}, \hat{\omega}') \geq \frac{C_p + C}{\theta_i}$ also implies that $p(L, \hat{\omega}, \hat{\omega}') \geq \frac{C_p + C}{\theta_j}$, meaning that any information delivered by the technology which appears as favorable for $P_i$ is also good for $P_j$. As it is easily seen, this is a weak requirement in the sense that it is sufficient that plaintiffs are aware of the fact that there is one chance to obtain at least a good information, to induce them to file a suit. There is no need to be sure that good news always arrive in the future.

The next corollary is also a straightforward consequence of the previous lemmas:

**Corollary 5** *If information has a positive value, then:*

*i) Any information favorable to the defendant (respectively, to the plaintiffs) reduces (increases) the settlement offer, as compared to the case where no no additional information arrives.*

*ii) The probability of settlement is smaller than one.*

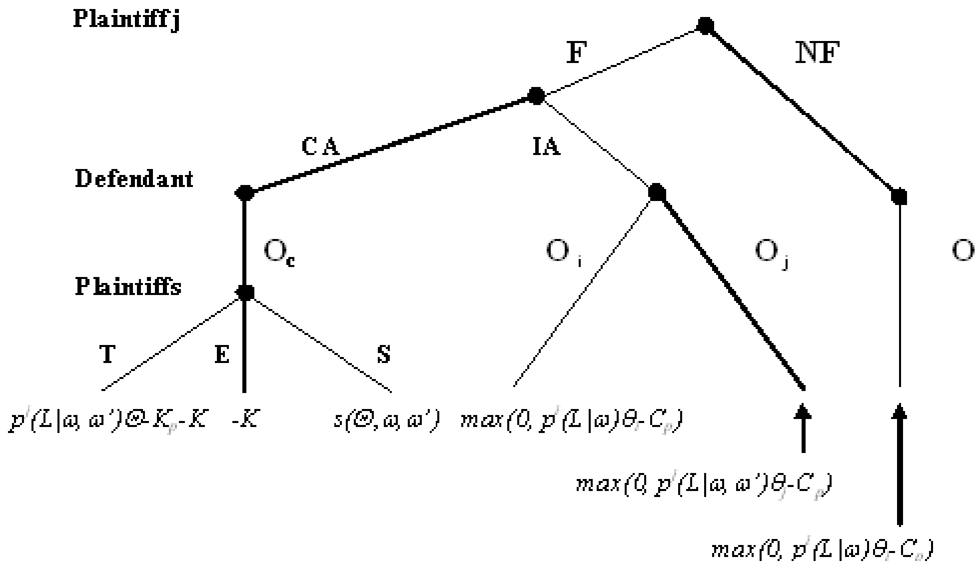
For the sake of proof, consider the first plaintiff's decision - the argument is the same for the second one. An information favorable to the defendant corresponds to a message satisfying: $p_L > p^i(L|\omega)$, which implies $p_L\theta_i - C_p > p^i(L|\omega)\theta_i - C_p$; the reverse inequalities apply in case of an information favorable to the plaintiff. Now, in the case where information is worth, there is only a subset $\Lambda_i \subset \Omega$ of possible messages for the first plaintiff such that $p^i(L|\omega)\theta_i - C_p > 0$, $\forall \omega \in \Lambda_i$ : then, the probability of settlement corresponds to the cumulative probability that the plaintiff obtains these favorable messages $\sum_{\omega \in \Lambda_i} p(\omega) < 1$.

## 3.2 Information sharing in Class Action

We now assume that class actions are available.

To begin with, let us focus more specifically on the proper subgame beginning after $P_j$ decides to adhere to the class actions. In stage 3, the defender makes an offer to the members, such that when the information pooled by the members of the class action corresponds to the messages $(\omega, \omega')$, the settlement benefit of each member is $s(\Theta, \omega, \omega')$.

Figure 3




**Lemma 6** *Consider the decision node in stage 3 where the defendant is facing a class action. For any combination of messages $(\omega, \omega') \in \Omega \times \Omega$, the best "one shot" individual offer made by the defendant to the class action is: $s(\Theta, \omega, \omega') = \max\left(0, p^j(L|\omega, \omega')\Theta - K_p\right)$. The CA members accept this offer.*

This implies that the defendant makes a positive offer to the Class Action soon as $p^j(L|\omega, \omega') > \frac{K_p}{\Theta}$. On the other hand, in any proper subgame in stage 3 beginning after that $P_i$ gives up to initiate a class action, or after that $P_i$ gives up to join it, the best individual offers of the defendant are those of lemma 1 (see also figure 3 where these subgames have been replaced by the defendant's best offer).

We can now analyze the efficient decisions of $P_j$, considering separately the decision to join or not the class action (decision node following the entry of $P_j$), and finally the decision to file or not (decision node initiating the subgame of figure 3). $P_j$'s efficient decisions in stage 2 may be as follows:

**Lemma 7** *Assume that there exists a subset of combinations of messages $\Lambda_j \subset \Omega^2$ such that for any $(\omega, \omega') \in \Lambda_j : p(L, \omega, \omega') \geq \frac{C_p + C}{\theta_j}$, and assume that $\alpha \leq \alpha^* \equiv \frac{C_p - K_p}{\pi^*(\theta_j - \theta_i)}$ where $\pi^* = \max \left\{ p^j(L|\omega, \omega'),\ \text{for all } (\omega, \omega') \in \Lambda_j \right\}$. Then, i) $P_j$ always files in the second stage, and ii) he prefers to join the class action when it has been initiated by $P_i$ rather than to sue individually.*

The following lemma focuses on the decision of the first plaintiff.

**Lemma 8** *Assume that there exists a subset of messages $\Lambda_i \subset \Omega$, such that for any $\omega \in \Lambda_i : p^i(L, \omega) \geq \frac{C_p + C}{\theta_i}$. Then, $P_i$ always files in the first stage, and he prefers to initiate the class action rather than to sue individually.*

Using the results of lemmas 6 to 8, we have:

**Proposition 9** *Assume that: (C1) there exists a unique combination of messages $(\omega, \omega') \in \Omega^2$ such that $p(L, \hat{\omega}, \hat{\omega}') \geq \frac{C_p + C}{\theta_i}$, and (C2): $\alpha \leq \hat{\alpha} \equiv \frac{C_p - K_p}{p^j(L|\hat{\omega}, \hat{\omega}')(\theta_j - \theta_i)}$. Then, there exists a SPE where i) the class action is formed, and ii) the aggregate case is settled.*

Proposition 9 displays a set of sufficient conditions in order that the class action comprising both types of individuals exists in equilibrium.

The result of proposition 9 is a direct consequence of our technology of information, and of our assumption that the discovery process is perfect allowing a perfect mutualization of information between plaintiffs and the defendant. In such a case, the two important issues are 1/ whether the first plaintiff prefers the structure of information defined by the set of his own personal messages, or the structure associated to the combination of two messages, his personal one and the information of the other plaintiff; 2/ whether the second one obtains a higher payments when he becomes a member of the class action or not.

In our set up, $P_j$ observes his own message and the first plaintiff's one whether or not he joins the class action; thus, he prefers to join the class action as long as the decrease in the litigation costs associated to the collective action ($K_p < C_p$) is not fully compensated by the decrease in the expected payment awarded at trial given that the court uses an index of the aggregate claim in case of a class action ($\Theta < \theta_j$): (C2) corresponds to the requirement needed to insure the participation of $P_j$ : it must be that the proportion of large stakes in population of plaintiff is high enough.

On the other hand, the basic reason explaining why the first plaintiff initiates the class action, is that when the discovery process is perfect, the posteriors distribution $p^j(L|.,.)$ is *more informative* in the sense of Blackwell (1953) than the posteriors distribution $p^j(L|.)$: for any message $\omega \in \Omega$, there always exists at least one message $\omega' \in \Omega$ such that: $p^j(L|\omega,\omega') > p^i(L|\omega)$ and one message $\omega'' \in \Omega$ such that: $p^j(L|\omega,\omega'') < p^i(L|\omega)$. Thus, the posterior beliefs $p^i(L|.)$ provides the plaintiff with some information which has been "garbled" in the transmission as compared to the priors $p^j(L|.,.)$. Anything goes as if the information associated to $p^j(L|.,.)$ were sent, but it has been received by $P_i$ with some additional noise, such that finally $P_i$ recognized only the information attached to $p^i(L|.)$.

It is straightforward to verify that when plaintiffs having large stake become the first filers, nothing more is added to the results, since the class action is formed under the same conditions as those in proposition 9. Thus, the order of plaintiffs' entry entails here no strategic aspect in contrast to what occurs in Daughety and Reinganum (2009), Mongrain and Marceau (2003), Saraceno (2008).

# 4 The case with conditional fees

One way to understand the results of the previous section is the following: for plaintiffs, the opportunity to obtain additional information may work as a credible threat in order to obtain recovery from the defendant, although they have pessimistic beliefs before trial. In this section, we introduce contingent fees as an alternative for attorney'earnings. An argument in favor of contingent or conditional fees is that they induce the absence of risk of filling a lawsuit for plaintiffs, since the risk is borne by the attorney: plaintiffs owe their attorney a fee only when there is recovery, *i.e.* when they win at trial.[4] In the present set up, the rational for conditional fees is assessed in terms of information acquisition.

When conditional fees are introduced, a plaintiff pays the amount corresponding to his attorney's services only in the case where he wins at trial. Hence, the expected payment at trial is equal to the probability to win (given the relevant information.) times his damage award minus attorney's fees:

$$\begin{aligned} p^i(L|\omega)(\theta_i - C_p) &\quad : \quad \textit{for } P_i \\ p^j(L|\omega,\omega')(\theta_j - C_p) &\quad : \quad \textit{for } P_j \\ p^j(L|\omega,\omega')\,(\Theta - K_p) &\quad : \quad \textit{for a Class Action} \end{aligned}$$

The following proposition shows that as compared to the decisions based on

[4] The other advantage is that they enable plaintiffs to monitor the effort undertaken by attorney for the time they spend to their clients' case, and give them efficient incentives to maximize their client's recovery (for references, see the introduction of the paper).

the priors, the arrival of new information during the litigation process does not change plaintiff's decision .

**Proposition 10** *Under conditional fees:*
*i) Parties always settle.*
*ii) The value of information is null for both plaintiffs.*
*iii) the settlement offers are larger than under the fixed costs rule*

Proposition 10 shows that plaintiffs become neutral to the arrival of news when contingent fees are used, such that the decision to file depends only on their initial belief of the outcome at trial. This suggests that if contingent fees may solve agency problems between plaintiffs and their counsel, on the other hand they may entail pervasive effects such as making victims not enough careful with the arrival of new information.

The intuition is the following. Consider a plaintiff with an initial belief on his case, who wants to verify the quality of his claim at trial: he may use a simple "test" corresponding to buying the services of a lawyer; this last one will inform the plaintiff whether he has a high probability to win at trial or a law one, and when alternative litigation strategies may be used at trial, contingent fees monitors attorney's efforts to choose the strategy leading to maximal recovery for plaintiff. Proposition 10 tells us that this test is of no value for the plaintiff: his initial decision to enter or not depends only on his prior beliefs on his case, when contingent fees are used, since in case of an individual suit for example we have: $Eu_i(\theta_i, p^i(L|.)) = Eu_i(\theta_i, p_L)$ and $Eu_j(\theta_j, p^j(L|.,.)) = Eu_j(\theta_j, p_L)$.

When contingent fees are used, a plaintiff pays an amount corresponding to a fixed percentage of the value of the claim only in case of recovery, *i.e.* the costs corresponding to the payment of attorneys' services is proportional to the expected value of the claim; in such a case, the value of the expected outcome at trial is a given percentage of the claim:.

$$\begin{array}{rcl} p^i(L|\omega)(1-t)\theta_i & : & \textit{for } P_i \\ p^j(L|\omega,\omega')(1-t)\theta_j & : & \textit{for } P_j \\ p^j(L|\omega,\omega')(1-\tau)\Theta & : & \textit{for a CA} \end{array}$$

with $t$ (respectively $\tau$) $\in ]0,1[$ being the percentage of the value of the claim in case of an individual action (collective action) charged by the attorney, and $t > \tau$. It is straightforward to verify that a similar result applies.

# 5 Conclusion

The present paper illustrates that the existence of positive informational externalities and the opportunity of information sharing could be a strong motive for the formation of a class action. In our set up, the discovery process is such that, whatever the available information, plaintiffs are not confident with respect to their chances of success at trial, *i.e.* they can not know whether the judge will be favorable to their case; on the one and, it is relatively easy to assess the value of individual damages (which may be considered as a public information), but on the second, the cause of the victims' injury may be quite difficult or costly to establish; thus, the plaintiffs' individual assessment of the likelihood to win at trial are always smaller than unity. Each plaintiff evaluates *ex-ante* the opportunity to file a suit or to give up, knowing that he will benefit of a new information later on and that the additional informations will generate a new assessment of his chances at trial, such that he will undertake *ex-post* the best decision conditionally on his information. In this way, we capture two salient points of the litigation process: i) a main relevant source of uncertainty for parties is created by the behavior of the court that is unknown *ex-ante*. ii) Scientific evidences are imperfect, some of them may be strongly controversial, there may exist a large disagreement between experts' opinions, judges may have bias of judgment, mistaken beliefs, and/or unfortunately reject some pieces of evidences. Our main result is that the opportunity to constitute a class action is not always exploited since, apart of scales economies, it depends on whether the discovery process provides good news as welle as bad news. Finally, we find that the contingent fees system reduces the incentives to organize class actions on an information sharing basis, in the sense that it renders plaintiffs neutral to the arrival of news.

# 6 References


Blackwell D. (1953), Equivalent comparison of experiments, *Annals of Mathematics and Statistics*, **24**, 265-272.

Che Y-K (1996), Equilibrium formation of Class Action suits, *Journal of Public Economics*, **62**, 339-361.

Daughety A. and Reinganum J. (2009), A Dynamic Model of Lawsuit Joinder and Settlement, *Mimeo*, July 2009, downloadable at:
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1446904.

Deffains B. and Demougin D. (2010), Class Actions, Compliance and Moral Cost, *Mimeo*, May 2010.

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

Emons W. (2007), Conditional versus contingent fees, *Oxford Economic Papers*, **59**, 89-101.

Emons W. and Garoupa N. (2006), The economics of US-style contingent fees and UK-style conditional fees: agency problems and the supply of legal services, *Managerial and Decision Economics*, **27**, 379-385.

Hirschleifer J. and Riley J. (1997), *The analytics of uncertainty and information*, Cambridge University Press.

Klement A. and Neeman Z. (2004), Incentive structures for Class Action lawyers, *The Journal of Law, Economics & Organization*, **20**, 102-124.

Laffont J-J (1988), *The economics of uncertainty and information*, MIT Press.

Lynk W. (1990), The courts and the market: an economic analysis of contingent fees in class-action litigation, *The Journal of Legal Studies*, **19**, 247-260.

Lynk W. (1994), The courts and the plaintiffs' bar: awarding the attorney's fees in class-action litigation, *The Journal of Legal Studies*, **23**, 185-209.

Marceau N. and Mongrain S. (2003), Damage averaging and the formation of Class Action suits, *International Review of Law and Economics*, **23**, 63-74.

Rasmusen E. (2001), *Games and information*, Blackwell Publishing.

Saraceno M. (2008), Group Litigation, Access to Justice and Deterrence, *Working Paper No 2008-04*, Amsterdam Center for Law & Economics.

Shavell S. (1989), Sharing information prior to settlement or litigation, *RAND Journal of Economics*, **20**, 183-195.

## APPENDIX

**Proof of lemma 1:**

Given that the administrative cost $C$ is sunk, it is easy to see that when $P_j$ obtains the message $\omega'$ after that $P_i$ has received message $\omega$, the defendant chooses a "take-it-or-leave-it" offer in order to render the plaintiff indifferent between going to trial (suing) or accepting the offer: hence $s(\theta_j, \omega, \omega') = \max\big(0, p^j(L|\omega,\omega')\theta_j - C_p\big)$, where $p^j(L|\omega,\omega')$ follows R1. Symmetrically, when he faces the message $\omega$ with $P_i$, the defendant makes a "take-it-ot-leave-it" offer in order to render the plaintiff indifferent between going to trial (suing) or accepting the offer: hence $s(\theta_i, \omega) = \max\big(0, p^i(L|\omega)\theta_i - C_p\big)$, where $p^i(L|\omega)$ follows R2. Hence the result. ■

**Proof of lemma 2:**

i) Consider that $\min\big\{p^j(L|\omega,\omega'), \forall(\omega,\omega') \in \Omega\times\Omega\big\} \geq \frac{C_p}{\theta_j}$; thus, $\forall(\omega,\omega') \in \Omega\times\Omega$, it comes that $\max\big(0, p^j(L|\omega,\omega')\theta_j - C_p\big) = p^j(L|\omega,\omega')\theta_j - C_p$, such that:

$$\begin{aligned}
& \sum_{(\omega,\omega')\in\Omega^2} p^j(\omega,\omega')\max\big(0, p^j(L|\omega,\omega')\theta_j - C_p\big) - C \\
= & \sum_{(\omega,\omega')\in\Omega^2} p^j(\omega,\omega')\big(p^j(L|\omega,\omega')\theta_j - C_p\big) - C \\
= & \; p_L\theta_j - C_p - C
\end{aligned}$$

given that, by construction of the technology of information, we have both:

$$\begin{aligned}
\sum_{(\omega,\omega')\in\Omega^2} p^j(\omega,\omega') &= 1, \\
\sum_{(\omega,\omega')\in\Omega^2} p^j(\omega,\omega')p^j(L|\omega,\omega') &= \sum_{(\omega,\omega')\in\Omega^2} p(L,\omega,\omega') = p_L
\end{aligned}$$

Hence the result.

ii) More generally, given that $\forall(\omega,\omega') \in \Omega\times\Omega : \max\big(0, p^j(L|\omega,\omega')\theta_j - C_p\big) \geq p^j(L|\omega,\omega')\theta_j - C_p$, we have after multiplying both terms of this inequality by $p^j(\omega,\omega')$ and then summing over all the possible messages:

$$\begin{aligned}
& \sum_{(\omega,\omega')\in\Omega^2} p^j(\omega,\omega')\max\big(0, p^j(L|\omega,\omega')\theta_j - C_p\big) - C \\
\geq & \sum_{(\omega,\omega')\in\Omega^2} p^j(\omega,\omega')\big(p^j(L|\omega,\omega')\theta_j - C_p\big) - C \\
= & \; p_L\theta_j - C_p - C
\end{aligned}$$

Hence $Eu_j(\theta_j, p^j(L|.,.)) \geq Eu_j(\theta_j, p_L)$, which is by definition the value of the information afforded by the available technology of messages. Thus, assuming a unique combination $(\omega, \omega') \in \Omega \times \Omega$ : such that $\max\left(0, p^j(L|\omega,\omega')\theta_j - C_p\right) = p^j(L|\omega,\omega')\theta_j - C_p$, the result is direct.

iii) Let us assume that there exists at least one combination of messages $(\hat{\omega}, \hat{\omega}') \in \Omega \times \Omega$ such that $p(L, \hat{\omega}, \hat{\omega}') \geq \frac{C_p + C}{\theta_j}$; remark that this implies:

$$p^j(L|\hat{\omega}, \hat{\omega}') = \frac{p(L, \hat{\omega}, \hat{\omega}')}{p^j(\hat{\omega}, \hat{\omega}')} \geq \frac{C_p}{p^j(\hat{\omega}, \hat{\omega}')\theta_j} \geq \frac{C_p}{\theta_j}$$

As a result, it comes that:

$$\begin{aligned} Eu_j(\theta_j, p^j(L|.,.)) &= p^j(\hat{\omega}, \hat{\omega}')\left(p^j(L|\hat{\omega}, \hat{\omega}')\theta_j - C_p\right) \\ &\quad + \sum_{(\omega,\omega') \neq (\hat{\omega}, \hat{\omega}')} p^j(\omega, \omega') \max\left(0, p^j(L|\omega,\omega')\theta_j - C_p\right) - C \\ &\geq p(L, \hat{\omega}, \hat{\omega}')\theta_j - p^j(\hat{\omega}, \hat{\omega}')C_p - C \\ &\geq p(L, \hat{\omega}, \hat{\omega}')\theta_j - C_p - C \end{aligned}$$

since by construction $\sum_{(\omega,\omega') \neq (\hat{\omega}, \hat{\omega}')} p^j(\omega, \omega') \max\left(0, p^j(L|\omega,\omega')\theta_j - C_p\right) \geq 0$. Now, given that $p(L, \hat{\omega}, \hat{\omega}')\theta_j - C_p - C \geq 0$ by assumption, we obtain $Eu_j(\theta_j, p^j(L|.,.)) \geq 0$. Hence the result. ■

**Proof of lemma 3:** omitted (qualitatively the same as in lemma 2).

**Proof of proposition 4:**
More specifically, we prove the following results:

**Claim 11** *Assume that there exists at least one combination of messages $(\hat{\omega}, \hat{\omega}') \in \Omega \times \Omega$ such that $p(L, \hat{\omega}, \hat{\omega}') \geq \frac{C_p + C}{\theta_i}$; then there is a Subgame Perfect Equilibrium which corresponds to the following set of actions:*

*1/ Each plaintiff files individually.*

*2/ The defendant makes two individual offers:*

$$\begin{aligned} s(\theta_i, \omega) &= \max\left(0, p^i(L|\omega)\theta_i - C_p\right), \forall \omega \in \Omega \text{ for } P_i, \text{ and} \\ s(\theta_j, \omega, \omega') &= \max\left(0, p^j(L|\omega,\omega')\theta_j - C_p\right), \forall (\omega, \omega') \in \Omega \times \Omega \text{ for } P_j \end{aligned}$$

*3/ Each plaintiff accepts (at each decision node where he has to play) his specific individual offer proposed by the defendant, for every possible information he may receive.*

**Proof of claim 13.** To prove 1/ it is sufficient to remark that if there exists at least one combination of messages $(\hat{\omega}, \hat{\omega}') \in \Omega \times \Omega$ such that $p(L, \hat{\omega}, \hat{\omega}') \geq \frac{C_p + C}{\theta_i}$, then we also have:

- $p(L,\hat{\omega},\hat{\omega}') \geq \frac{C_p+C}{\theta_j}$; thus, by part v) of lemma 2, $P_j$ always files, given that he accepts any offer $s(\theta_j,\omega,\omega') = \max\left(0, p^j(L|\hat{\omega},\hat{\omega}')\theta_j - C_p\right)$,

- $p^i(L,\hat{\omega}) \equiv \sum_{\omega'\in\Omega} p(L,\hat{\omega},\omega') > p(L,\hat{\omega},\hat{\omega}') \geq \frac{C_p+C}{\theta_i}$; thus, by part v) of lemma 3, $P_i$ accepts the offer $s(\theta_i,\omega) = \max\left(0, p^i(L|\hat{\omega})\theta_i - C_p\right)$, and he always files. 2/ and 3/ are direct from lemma 1. ■

**Proof of lemma 6:** as lemma 1, it is straightforward since $K$ is sunk. ■

**Proof of lemma 7:**

Consider the subgame where the defendant offers $s(\theta_j,\omega,\omega')$ to $P_j$, which is accepted. Remark first that if the subset $\Lambda_j \subset \Omega^2$ exists, for any $(\omega,\omega') \in \Lambda_j$, $P_j$ may obtain a positive payment equal to $\max\left(0, p^j(L|\omega,\omega')\theta_j - C_p\right) = p^j(L|\omega,\omega')\theta_j - C_p \geq 0$. Thus, following the proof of part v) in lemma 2, had he decided to sue individually, $P_j's$ expected utility level would be positive since:

$$Eu_j(\theta_j, p^j(L|.,.)) \geq \sum_{(\omega,\omega')\in\Lambda_j} p(L,\omega,\omega')\theta_j - C_p - C \geq 0$$

given that by construction for any $(\omega,\omega') \in \Lambda_j : p(L,\omega,\omega')\theta_j \geq C_p + C$. Now for any message $(\omega,\omega') \in \Omega\times\Omega$, in order that $P_j$ be better off when he joins the CA rather than to have sued individually, it must be that:

$$p^j(L|\omega,\omega')\Theta - K_p \geq p^j(L|\omega,\omega')\theta_j - C_p$$

which is true as far as $\alpha \leq \frac{C_p-K_p}{p^j(L|\omega,\omega')(\theta_j-\theta_i)}$. Hence assume that $\alpha \leq \alpha^* \equiv \frac{C_p-K_p}{\pi^*(\theta_j-\theta_i)}$ where $\pi^* = \max\left\{p^j(L|\omega,\omega'), \text{ for all } (\omega,\omega')\in\Lambda_j\right\}$; then for any $(\omega,\omega') \in \Lambda_j$:

$$p^j(L|\omega,\omega')\Theta - K_p - K \geq p^j(L|\omega,\omega')\theta_j - C_p - K \geq p^j(L|\omega,\omega')\theta_j - C_p - C$$

Finally, after multiplying both the LHS and the RHS terms of this inequality by $p^j(\omega,\omega')$ and then summing over all the possible messages, we obtain:

$$Eu_j(\Theta, p^j(L|.,.)) \geq Eu_j(\theta_j, p^j(L|.,.)) \geq 0$$

Hence the result. ■

**Proof of lemma 8:**

The crucial issue is whether the first plaintiff prefers the structure of information defined only by the set of his own personal messages, or the structure of information associated to the set of combinations of two messages, his personal ones and the messages of the other plaintiff. We shall show that the second one is *more informative* in the sense of Blackwell (1953) than the first one; as a result, $P_i$ obtains a higher expected utility with the second one.

To understand this, remark that by (R2) for any message $\omega \in \Omega$ we have:

$$
\begin{aligned}
p^i(L|\omega) &= \sum_{\omega' \in \Omega} \frac{p(L,\omega,\omega')}{\sum_{\omega' \in \Omega} p(L,\omega,\omega') + \sum_{\omega' \in \Omega} p(NL,\omega,\omega')} \\
&= \sum_{\omega' \in \Omega} \left( \frac{p(L,\omega,\omega') + p(NL,\omega,\omega')}{\sum_{\omega' \in \Omega} p(L,\omega,\omega') + \sum_{\omega' \in \Omega} p(NL,\omega,\omega')} \right) \left( \frac{p(L,\omega,\omega')}{p(L,\omega,\omega') + p(NL,\omega,\omega')} \right)
\end{aligned}
$$

which means that the following relationship linking $P_i's$ the two types of posterior beliefs $p^i(L|.)$ and $p^j(L|.,.)$ always applies:

$$
\forall \omega \in \Omega : p^i(L|\omega) = \sum_{\omega' \in \Omega} \beta(\omega,\omega') p^j(L|\omega,\omega') \tag{1}
$$

with $\beta(\omega,\omega') = \frac{p^i(\omega,\omega')}{p^i(\omega)} < 1$ and $\sum_{\omega' \in \Omega} \beta(\omega,\omega') = 1$, meaning that the posteriors $p^j(L|.,.)$ are more spread than the posteriors $p^j(L|.)$, *i.e.* for any message $\omega \in \Omega$, there always exists at least one message $\omega' \in \Omega$ such that: $p^j(L|\omega,\omega') > p^i(L|\omega)$, and there always exists at least one message $\omega'' \in \Omega$ such that: $p^j(L|\omega,\omega'') < p^i(L|\omega)$. By definition, this amounts to say that the posteriors $p^j(L|.,.)$ are more informative than the posteriors $p^j(L|.)$. This is useful in the rest of the proof.

When $P_i$ initiates a CA, and when $P_j$ joins it, information sharing between plaintiffs leads to an expected utility level for the former which is by definition:

$$
Eu_i(\Theta, p^j(L|.,.)) = \sum_{(\omega,\omega') \in \Omega^2} p^i(\omega,\omega') \max\left(0, p^j(L|\omega,\omega')\Theta - K_p\right) - K
$$

with $p^i(L|\omega,\omega') = p^j(L|\omega,\omega'), \forall(\omega,\omega') \in \Omega^2$, whereas if $P_i$ files an individual suit, he obtains:

$$
Eu_i(\theta_i, p^i(L|.)) = \sum_{\omega \in \Omega} p^i(\omega) \max\left(0, p^i(L|\omega)\theta_i - C_p\right) - C
$$

Hence, $P_i$ initiates the CA more particularly soon as:

$$
Eu_i(\Theta, p^j(L|.,.)) \geq Eu_i(\theta_i, p^i(L|.)) \geq 0 \tag{2}
$$

Let us exhibit simple conditions under which the RHS inequality in (2) is true. For that, assume that there exists a subset of message $\Lambda_i \subset \Omega$ such that any $\hat{\omega} \in \Lambda_i$ satisfies: $p^i(L,\hat{\omega}) \geq \frac{C_p+C}{\theta_i}$, which implies that $p^i(L|\hat{\omega}) \geq \frac{C_p}{\theta_i}$; as a consequence, it is easy to see that:

$$
\begin{aligned}
Eu_i(\theta_i, p^i(L|.)) &= \sum_{\hat{\omega} \in \Lambda_i} p^i(\hat{\omega}) \left(p^i(L|\hat{\omega})\theta_i - C_p\right) - C \\
&\geq \sum_{\hat{\omega} \in \Lambda_i} p^i(L,\hat{\omega})\theta_i - C_p - C \\
&\geq 0
\end{aligned}
$$

Remark now that by (1), we have $p^i(L|\hat{\omega})\theta_i - C_p = \sum_{\omega' \in \Omega} \beta(\hat{\omega}, \omega') p^j(L|\hat{\omega}, \omega')\theta_i - C_p$, for any any $\hat{\omega} \in \Lambda_i$, implying thus:

$$\begin{aligned}
\sum_{\omega' \in \Omega} \beta(\hat{\omega}, \omega') p^j(L|\hat{\omega}, \omega')\theta_i - C_p &\leq \sum_{\omega' \in \Omega} \beta(\hat{\omega}, \omega') \left(p^j(L|\hat{\omega}, \omega')\theta_i - C_p\right) \\
&\leq \sum_{\omega' \in \Omega} \beta(\hat{\omega}, \omega') \max\left(0, p^j(L|\hat{\omega}, \omega')\theta_i - C_p\right)
\end{aligned}$$

Pre-multiplying by $p^i(\hat{\omega})$, summing over all $\hat{\omega} \in \Lambda_i$, and finally rearranging, we obtain:

$$\begin{aligned}
\sum_{\hat{\omega} \in \Lambda_i} p^i(\hat{\omega}) \left(p^i(L|\hat{\omega})\theta_i - C_p\right) &\leq \sum_{\hat{\omega} \in \Lambda_i} \sum_{\omega' \in \Omega} p^i(\hat{\omega}) \beta(\hat{\omega}, \omega') \max\left(0, p^j(L|\hat{\omega}, \omega')\theta_i - C_p\right) \\
&= \sum_{\hat{\omega} \in \Lambda_i} \sum_{\omega' \in \Omega} p^i(\hat{\omega}, \omega') \max\left(0, p^j(L|\hat{\omega}, \omega')\theta_i - C_p\right) \\
&\leq \sum_{(\omega, \omega') \in \Omega^2} p^i(\omega, \omega') \max\left(0, p^j(L|\omega, \omega')\theta_i - C_p\right) \\
&= Eu_i(\theta_i, p^j(L|., .))
\end{aligned}$$

Now, given that $\Theta > \theta_i$ and using assumption 2, it comes that: $Eu_i(\Theta, p^j(L|., .)) \geq Eu_i(\theta_i, p^j(L|., .))$. Hence (2) holds, and the lemma 8 is proven. ■

**Proof of proposition 9:**

Once more, we prove the following claim:

**Claim 12** *Assume that: (C1) there exists a unique combination of messages* $(\omega, \omega') \in \Omega^2$ *such that* $p(L, \hat{\omega}, \hat{\omega}') \geq \frac{C_p + C}{\theta_i}$*, and (C2):* $\alpha \leq \hat{\alpha} \equiv \frac{C_p - K_p}{p^j(L|\hat{\omega}, \hat{\omega}')(\theta_j - \theta_i)}$*. Then, there is a SPE associated to the following set of actions:*

*1/ Each plaintiff files.*

*2/* $P_i$ *initiates the CA, and* $P_j$ *joins it.*

*3/ The defendant makes three offers:*

$$\begin{aligned}
s(\theta_i, \omega) &= \max\left(0, p^i(L|\omega)\theta_i - C_p\right), \forall \omega \in \Omega \textit{ for } P_i \\
s(\theta_j, \omega, \omega') &= \max\left(0, p^j(L|\omega, \omega')\theta_j - C_p\right), \forall (\omega, \omega') \in \Omega \times \Omega \textit{ for } P_j \\
s(\Theta, \omega, \omega') &= \max\left(0, p^j(L|\omega, \omega')\Theta - K_p\right), \forall (\omega, \omega') \in \Omega \times \Omega \textit{ for a Class Action}
\end{aligned}$$

*4/ At each decision node in stage 3 where he has to choose an action, each plaintiff accepts the offer (either individually or as a member of the CA) proposed by the defendant, for every possible information they may receive.*

Once more, we do not tackle with the problem of multiplicity of equilibria, only focusing on the equilibrium path where the class action is formed.

**Proof of claim 14.** To prove 1/ and 2/ it is sufficient to remark that if there exists a unique combination of messages $(\hat{\omega}, \hat{\omega}') \in \Omega \times \Omega$ such that $p(L, \hat{\omega}, \hat{\omega}') \geq \frac{C_p + C}{\theta_i}$, then we also have:

- $p^j(L|\hat{\omega}, \hat{\omega}') \geq p(L, \hat{\omega}, \hat{\omega}') \geq \frac{C_p+C}{\theta_j}$; thus, if $\alpha \leq \frac{C_p - K_p}{p^j(L|\hat{\omega},\hat{\omega}')(\theta_j - \theta_i)}$ by lemma 7, $P_j$ always files and joins the CA initiated by the other plaintiff,

- $p^i(L|\hat{\omega}) \geq p^i(L, \hat{\omega}) \equiv p(L, \hat{\omega}, \hat{\omega}') + \sum_{\omega' \neq \hat{\omega}'} p(L, \hat{\omega}, \omega') > p(L, \hat{\omega}, \hat{\omega}') \geq \frac{C_p+C}{\theta_i}$; thus, by lemma 8, $P_i$ always files and initiated the CA,

Finally, 3/ and 4/ are direct from lemma 5. ■

**Proof of proposition 10:**

Consider the case of the first type of plaintiffs. Equivalent arguments may be obtained in the case of the second plaintiff and in the case of a CA.

When conditional or contingent fees are introduced, the defendant's best offers to plaintiff $i$ in stage 3 are the following, under assumption 2:

$$
\begin{aligned}
s(\theta_i, \omega) &= \max\left(0, p^i(L|\omega)(\theta_i - C_p)\right) \\
&= p^i(L|\omega)(\theta_i - C_p) : \textit{under conditional fees} \\
s(\theta_i, \omega) &= \max\left(0, p^i(L|\omega)(1-t)\theta_i\right) \\
&= p^i(L|\omega)(1-t)\theta_i : \textit{under contingent fees}
\end{aligned}
$$

i) Thus, whatever the message, the plaintiff always obtains a positive payment - thus, he always accepts the defendant's offer.

ii) As a result, the plaintiff' individual expected utility level in case of individual suits is equal to:

$$
Eu_i(\theta_i, p^i(L|.)) = p_L(\theta_i - C_p) - C = Eu_i(\theta_i, p_L) \tag{3}
$$

Notice that by assumption 1: $Eu_j(\theta_j, p_L) > Eu_i(\theta_i, p_L)$. It is straightforward to see that individual suits are both beneficial for the plaintiffs soon as $Eu_i(\theta_i, p_L) \geq 0$, meaning that their common priors must satisfy: $p_L \geq \frac{C}{\theta_i - C_p}$.

iii) Finally, both contingent and conditional fees (for a normalized cost : $t\theta_i = C_p$) allows for higher settlement offers, given that they induce a decrease in the expected payments from plaintiffs to their attorney:

$$
\begin{aligned}
p^i(L|\omega)\theta_i - C_p &> p^i(L|\omega)(\theta_i - C_p) : \textit{under conditional fees} \\
p^i(L|\omega)\theta_i - C_p &> p^i(L|\omega)(1-t)\theta_i : \textit{under contingent fees}
\end{aligned}
$$

as compared to the fixed costs system of the previous section.