CAN GROUP LITIGATION IMPROVE DETERRENCE?

July 30, 2007

Margherita Saraceno*

Abstract

Policymakers are currently evaluating group litigation as a device to guarantee effective access to justice and improve deterrence in torts affecting multiple victims. This paper focuses on how group litigation affects: 1) access to justice, 2) the choice between settlement and litigation, 3) the settlement amount, and finally, 4) deterrence. Our main finding is that group litigation does not always improve deterrence. On the one hand, group litigation makes it easier for victims to sue, by creating scale economies and improving their confidence in trial. On the other hand, the group is costly for victims to organize and reduces the injurer’s liability costs by facilitating settlement and also creating scale economies. The combined effect might be a reduction, rather than an increase, in the deterrent effect of tort law.

Keywords: litigation, group litigation, deterrence, access to justice, class action.


*Political Economy and Legal Order Ph.D. Program, University of Pavia and Paolo Baffi Centre, Bocconi University, Milan. Email: margherita.saraceno@unibocconi.it. I wish to thank Paolo Colla, Lucia Dalla Pellegrina, Giuseppe Dari-Mattiacci, Andrea Giussani, Donato Masciandaro, Donatella Porrini, Giorgio Rampa, Michele Taruffo for useful suggestions. The usual disclaimer applies. Comments will be appreciated.
1 Introduction

Environmental accidents, defective products, and financial markets scandals usually involve many victims. When the harm generated by the injurer is widely dispersed, small claimants often find it unattractive to file an individual lawsuit. In such cases, the liability system is ineffective with respect to both deterrence and compensation of losses. Recent events, such as the financial scandals of Enron, Parmalat and Cirio, or many US antitrust cases have lead policymakers of several countries to debate the effectiveness of group litigation as a means to improve the performance of the liability system. This question is on the policy agenda, both in countries where group litigation already exists\(^1\) and in countries where it does not exist\(^2\).

In the literature, group litigation has long been considered a controversial issue\(^3\). In the United States, the first provision for group litigation was set up in 1833. Since the birth of the modern class action, in 1938, and its main reform in 1966, it has been amended, analyzed and several times criticized\(^4\). The seminal work by Miller (1979) vividly describes the dispute about class action that continues today. Despite the specific technicalities of the American class action, four issues characterize the debate on group litigation in general:

*Group litigation as a means to guarantee effective protection of rights and access to justice.* In case of dispersed harm affecting many people, individual lawsuits are often too expensive. Thus, access to justice becomes ineffective and victims have no realistic way to protect their rights. These situations usually occur in environmental accidents, and in consumer and financial market damages. Often, in such cases, legal scholars suggest that group litigation could improve the effective protection of individual rights that are collectively infringed upon and guarantee access to justice for all. Opponents suggest that group litigation can be a misused device for filing frivolous and unmeritorious suits. (Kalven and Rosenfield, 1941; Giussani, 1996; Hensler and Pace, 2000; and Taruffo, 2001).

*Group litigation as a means for compensating small losses.* Group

\(^1\)Brazil, Canada, the Netherlands, Norway, Portugal, Sweden, and, obviously the United States. For instance, in the United States, the classical means of group litigations -class action- is a very controversial legal and law and economics topic. See Miller (1979), Hensler and Pace (2000).

\(^2\)French, Germany and Italy, (in which some specific and narrowly used procedural devices exist without the aim at compensating weak party), European Union. See Economist (2007). About the debate in a comparative perspective, see Rowe (2001).

\(^3\)For a survey, see Yeazell (1980a) and (1980b).

\(^4\)For a brief historical approach see Hensler and Pace (2000, pp. 10-39).
litigation can represent a remedy for damages suffered by a group of people who are unable to obtain redress by means of individual actions\textsuperscript{5}. According to Giussani, (1996) and Poncibò (2006), group litigation can provide compensation to weak victims that would not receive any relief otherwise. Opponents suggest that the net redress for victims is usually insufficient to compensate losses because of the huge amount of fees to be paid to the plaintiff counsel or because of unfair settlements\textsuperscript{6}.

\textit{Group litigation as a means for improving deterrence.} A broad range of legal literature supports group litigation as a means of enforcing regulations and deterring unlawful conducts\textsuperscript{7}. In fact, when individual lawsuits are unattractive for weak victims, tort law is not enforced. Consequently, the incentives created by the liability system are diluted. Group litigation, by facilitating effective access to justice, fosters the “private” and decentralized enforcement that characterizes tort liability. In 1969, Wright suggested that class action is a means of cost-internalization and regulation enforcement. About 35 years later, in an environment of financial scandals, this suggestion appears timely once again. According to Epstein (2003), Ferrarini and Giudici (2005), and Porrini and Ramello (2005), group litigation can play a fundamental role in private enforcement of regulations and represents a strong mechanism to deter misbehaviors. Critics argue that group litigation by facilitating trivial or non-meritorious lawsuits, might force corporations and firms to take an excessive amount of precautions. They conclude that this “overdeterrence”, in the end, is paid by consumers in the form of increased product and service costs\textsuperscript{8}.

\textit{Group litigation and judicial economy.} Group litigation, in general, and class action, in particular, can be a device for courts and parties to efficiently manage several claims of the same nature by reducing administrative costs of trial. Some critics contrast this point by suggesting that managing complex class actions could be inefficient\textsuperscript{9}. Other critics observe that, as seen above, group litigation improves access to justice (and to courts) making lawsuits more attractive for litigants. Thus, group litigation could enable more litigation, increasing courts’ workload\textsuperscript{10}. Ac-

\textsuperscript{5} About the problem of the “small claims” see Yngvesson and Hennessey (1975).
\textsuperscript{6} About this debate, see Miller (1979), Coffe (1995) and Hensler and Pace (2000).
\textsuperscript{8} About this issue, see Hensler and Pace (2000). However, the problem of frivolous lawsuits is a problem of reasonableness and foundation of lawsuit, and of the judiciary system’s aptitude to detect and discourage untenable suits.
\textsuperscript{9} See Coffee (1995).
\textsuperscript{10} About this issue Hensler and Pace (2000). This point has been approached by
cording to Giussani (2002), such an objection must be rejected in case of meritorious lawsuits: an increasing level of rights protection is not an inefficient increase of courts’ workload.

Although the topic of group litigation has been long debated, it remains a controversial judicial procedure. The law and economics literature has broadly analyzed failures in the liability system\textsuperscript{11} and the related problem of underdeterrence. Particularly, authors have studied problems such as “judgment proofness”\textsuperscript{12} and “disappearing defendants”\textsuperscript{13}, examining several solutions\textsuperscript{14}. Litigation and procedures have also been analyzed\textsuperscript{15}. Nevertheless, law and economics considers group litigation mainly in the form of the American class action, and analyzes its microstructure\textsuperscript{16}. This paper addresses the more general question of whether group litigation can represent a suitable means of correcting situations of diluted liability and guaranteeing an effective liability system.

In particular, this paper compares the benchmark case of individual empirical works, too. See, for example, Bernstein (1978).

\textsuperscript{11}For a review about tort law in law and economics literature, see Shavell (2005). See also Calabresi (1970); Shavell (1984a) and Cooter and Ulen (2000). Many authors have debated merits and limits of tort law from different perspectives and have considered problems occurring in the liability system in order to compare the suitability of alternative rules and to suggest legal solutions for diluted liability. For an exhaustive review about law and economics approaches, see Parisi (2004).

\textsuperscript{12}The injurers do not pay the appropriate damage award. See Shavell (1986), and Summer (1983).

\textsuperscript{13}Injurers are erroneously held not liable by the court because of a latent causation or a delayed occurrence of the harm. See Summer (1983) and Dari-Mattiacci and De Geest (2005).

\textsuperscript{14}For some suggested solutions see: Cooter (1989) about punitive damages, Kornhauser and Ravez (1994) about joint and several liability, Shavell (2005) about minimum asset requirement, Sykes (1984) about vicarious liability. Others authors have supported the joint use of \textit{ex ante} and \textit{ex post} regulation in case of uncertainty, in order to correct inefficiencies associated with the sole use of a type of regulation. See Shavell (1984a) and (1984b), and Kolstad, Ulen and Johnson (1990).

\textsuperscript{15}For a survey about litigation in law and economics literature, see Spier (2005).

\textsuperscript{16}Game theory, “principal-agent” models and information theory have enriched the debate over the class action. The literature is vast. For a review see Silver (1999) and Miller (1998). Many criticisms against the class action (but also many of its advantages) are strongly bounded by specific technicalities. Law and economics has broadly studied class actions’ technicalities. About the role of the class counsel, the optimal design of the counsel’s fees, and the problems of collusion between the defendant and the class counsel, see Coffe (1986), (1987), and (1995), Macey and Miller (1991), Morawetz (1993). About the unfair settlements, see Alexander (1991), Che (1996), Coffe (1995), Hay (1997). About “opt in” and “opt out” rules, see Eisenberg and Mille (2004). Finally, about the interaction between class plaintiffs, see Deffains, Langlais and Doriat-Duban (2005).
litigation with group litigation. The model identifies two main points specific to group litigation: first, group litigation reduces individual litigation costs by creating scale economies for both the injurer and the victims, while introducing transaction costs due to organization of the group. Second, group litigation fosters victims’ optimism and injurer’s pessimism about the outcome of the trial. Moreover, it improves the victims’ bargaining power in settlement negotiations.

Comparison between individual and group litigation is made with respect to four dimensions of the problem. First, we consider the victims’ access to justice as the probability that they take action against the injurer. Second, in case of action we study the choice between settlement and litigation. Third, we consider how group litigation affects the settlement amount. Fourth, we examine deterrence. Our main results are as follows:

**Access to justice.** Victims choose whether to take action on the basis of the expected trial outcome. Given a fair damage redress\(^{17}\), victims’ litigation costs and confidence in success are determinants of their expectation about trial outcome. Group litigation can enlarge effective rights protection by improving access to justice in two cases: when it guarantees sufficient scale economies in victims’ litigation costs, and when it sufficiently empowers victims in trial by improving their confidence in success.

**Litigation versus settlement.** In case of action, parties can litigate in court or settle. Probabilities of settlement and litigation depend on the parties’ litigation costs and subjective beliefs about trial outcome. On the one hand, savings in litigation costs facilitate litigation. On the other hand, convergence in the parties’ beliefs and the injurer’s pessimism make more likely settlement because parties can save litigation costs by settling\(^{18}\). Thus, the model suggests that group litigation, for given values of victims’ probability of success in trial, leads courts to be more frequently involved in litigation cases. However, group litigation can improve the settlement of cases by fostering injurer’s pessimism.

**Settlement amount.** Moreover, expectations about the trial outcome affect settlement terms. When the parties’ beliefs that victims will prevail in trial and the injurer’s litigation costs increase, the settlement amount increases too. In fact, parties have stronger incentives to save litigation costs by settling. Thus, with respect to the settlement terms, the model shows that group litigation can enlarge the amount settled by parties through its victims’ empowerment effect. Instead, group lit-

\(^{17}\)Damage compensation equals to suffered damage.

\(^{18}\)This outcome is standard in the literature about settlement. See Hay and Spier (1998).
igation can reduce the settlement amount by reducing injurer’s litigation cost. Group litigation also reduces the range between minimum and maximum settlement amount negotiable by the victims.

**Deterrence.** Deterrence depends on how much the liable injurer expects to pay for his/her unlawful conduct. This in turn depends on the probability of action, the probability of litigation or settlement and the settlement terms. Our main finding is that group litigation does not always improve deterrence. On the one hand, group litigation facilitates access to justice for victims by creating scale economies and improving their confidence in trial. On the other hand, it imposes an additional transaction cost on victims in order to proceed as a group. Group litigation also reduces the injurer’s liability costs by facilitating settlement and reducing litigation costs. The combined effect might be a reduction, rather than an increase, in the deterrent effect of tort law.

The paper is organized as follows: in Section 2, I propose a simple model of individual and group litigation. In Section 3, group litigation is compared with individual litigation according to our main research questions: 1) how does group litigation affect access to justice? 2) how does group litigation affect the parties’ choice to settle? 3) how does group litigation affect the settlement amount? 4) how does group litigation affect deterrence? Section 4 concludes.

## 2 The Model

Consider \( N \) identical risk neutral\(^{19} \) victims (V) who, in case of accident, suffer a monetary harm, and an injurer (I) who is a large risk neutral agent conducting a potentially harmful activity.

Define \( x \) as the amount of precaution that the injurer can take in order to reduce the probability of harm occurring, and \( g(x) \geq 0 \) as the cost of precaution, where \( g'(x) > 0, g''(x) > 0^{20} \).

The harm suffered by every representative victim (per capita damage) has magnitude \( h \) and is assumed not to depend on \( x \). Harm is generated by the injurer with probability \( p(x) \), where \( 0 \leq p(x) \leq 1 \), is continuous, downward sloping in \( x \) \( (p'(x) < 0) \) and convex over the relevant region \( (p''(x) > 0)^{21} \). The magnitude of the harm is perfectly verifiable: in fact, the judge is able to determine the exact magnitude of the harm, and in a judgement in favour of the victim, he/she awards a

\(^{19}\)This assumption may be relaxed in further extension.

\(^{20}\)Where \( g'(x) \) and \( g''(x) \) are the first derivative and the second derivative of the function \( g \) with respect to \( x \).

\(^{21}\)These assumptions are common in the law and economics literature. See Shavell (2005). Further, given the arguments that will be discussed, this assumption is without loss of generality.
per capita damage compensation equal to $h$. However, causation (and thus the injurer’s liability) is not always verifiable by the court. In fact the court can find an injurer who is liable to be not liable (type I error)\textsuperscript{22}. Because of uncertainty about the trial outcome parties have subjective beliefs about the possibility of prevailing in trial.\textsuperscript{23}

Legal costs are allocated according to the “American rule”: every part in case of litigation bears his/her own legal cost\textsuperscript{24}. Parties can avoid the trial by settling the case and thereby saving on legal costs.

2.1 The benchmark case: individual lawsuit

In case of individual litigation, define:

- $C_V \geq 0$ as the victim’s legal cost;
- $C_I \geq 0$ as the injurer’s legal cost;
- $q_V$ as the victim’s subjective probability of prevailing in trial. Obviously $0 \leq q_V \leq 1$;
- $q_I$ as the injurer’s subjective probability that the victim will prevail in trial. Obviously $0 \leq q_I \leq 1$;
- $a$ as the injurer’s bargaining power in settlement negotiations, where $0 \leq a \leq 1$. Consequently, the victim’s bargaining power is $(1 - a)$.

2.1.1 Suit, settlement and trial

If an accident occurs, a victim has to choose whether to proceed against the injurer. He/she decides to sue the injurer only if his/her expected trial outcome is nonnegative, thus, if:

$$T_V^e = q_V h - C_V \geq 0$$

Otherwise his/her threat to sue is not credible and no action follows. If the individual action constraint (1) holds, victims evaluate individual litigation \textit{versus} settlement. They prefer the settlement only when they can bargain a settlement amount ($S$) greater than their expected trial outcome ($T_V^e$), thus when:

\textsuperscript{22} About problems in proving guilt and the concept of “disappearing defendant” see Summer (1983). The model analyzes only meritorious suits (no type II error).

\textsuperscript{23} About uncertainty, information asymmetries, and parties’ beliefs in litigation, see Shavell (1982), Bebchuk (1984), Cooter and Rubinfeld (1989).

\textsuperscript{24} In a further extension the British rule will be analyzed.
\[ S > T^e_V \geq 0 \]  

Obviously, the injurer accepts the settlement agreement only if \( S \) is less than his/her expected outcome of the trial \( T^e_I = q_I h + C_I \), thus when:

\[ S < T^e_I \]  

Rearranging (1), (2) and (3), settlement occurs when:

\[ \frac{C_V}{h} \leq q_V \leq \frac{C_V + C_I}{h} + q_I \]  

Thus,

- If \( q_V < \frac{C_V}{h} \), there is no action. This means that the victim’s access to justice depends on how his/her subjective probability of prevailing in trial compares to her/his cost-damage compensation ratio;
- If \( \frac{C_V}{h} \leq q_V \leq \frac{C_V + C_I}{h} + q_I \), parties settle out of court;
- If \( \frac{C_V + C_I}{h} + q_I < q_V \), parties litigate.

In case of settlement (thus when (4) holds), the cooperative surplus from settlement \( (T^e_I - T^e_V) \) is divided among the parties according to their bargaining power and thus, the settlement amount is equal to:

\[ S(q_V, q_I) = a (q_V h - C_V) + (1 - a) (q_I h + C_I) \]  

2.1.2 Deterrence

The injurer’s problem is to define his/her own optimal level of precaution, \( ex \anta e \), before harm occurs and before any litigation threat. He/she decides the optimal level of precaution following a backward-induction process, as shown in figure 1. [Insert figure 1.]

Note that parties have subjective expectations over the uncertain outcome of the trial and, \( ex \anta e \), the injurer knows his/her subjective probability, but he/she only knows that the victim’s subjective probability of prevailing in trial is distributed with a density function \( f(q_V) \), positive, continuous, and differentiable over the interval \([0, 1]\) and zero elsewhere, and with a cumulative function \( F(q_V) \)\[^{28}\].

\[^{25}\text{Note that, when } C_V \geq h, \text{ action never occurs.}\]
\[^{26}\text{Note that, when } C_V < h, \text{ and } C_V + C_I \geq h, \text{ only settlement occurs.}\]
\[^{27}\text{We obtain settlement amount from } S = T^e_V + (T^e_I - T^e_V) (1 - a).\]
\[^{28}\text{In a similar way, Bebchuk, (1984) models a problem of imperfect information about the trial outcome.}\]
Thus, the potential injurer minimizes the precaution cost plus the total expected cost in case of accident and chooses an amount of precaution $x_{IL}^*$, by

$$\min_x g(x) + p(x)ND_{IL}$$

where $D_{IL}$ is the injurer’s expected cost in case of accident for each victim. $D_{IL}$ is equal to $E(S) + E(T)^i$ (expected cost of settlement plus expected cost of litigation)$^{29}$.

$$\begin{align*}
E(S) &= \int_{\frac{CV}{h}}^{\frac{CV+C_l}{h}+q_V} f(q_V)S(q_V)dq_V \\
E(T)^i &= (q_Ih + C_I) \int_{\frac{CV+C_l}{h}+q_V}^{1} f(q_V)dq_V
\end{align*}$$

The first order condition implies an amount of precaution $x_{IL}^*$:

$$g'(x) = -p'(x)ND_{IL}$$

Note that, $D_{IL}$ does not depend on the level of care, but vice versa, the level of care depends on $D_{IL}^e$.

### 2.2 Group litigation

Let us now examine group litigation (G.L.). Two main points characterize G.L. with respect to individual litigation:

1. G.L. reduces individual litigation costs$^{30}$ by creating scale economies for both the injurer and the victims while introducing a transaction cost due to the group organization$^{31}$.

2. G.L. determines an empowerment of victims. In fact, proceeding against the injurer as a group, improves victims’ know-how.

---

$^{29}$Note that, when $q_V < \frac{CV}{h}$, $D_{IL}$ is equal to zero.


$^{31}$In the model it is assumed a generic transaction cost. Evidently, depending on the specific group litigation “design”, transaction costs meaningfully change. In case of American class action, for example, victims have to pay for the representative plaintiff and to the class counsel premium even a large amount of redress. In other kinds of collective action, let’s imagine transaction cost as fees in order to support and organize associations by which victims proceed as group, and as management group costs.
and skills in litigation\textsuperscript{32}. Furthermore, public opinion pressure, potential reputation loss for the injurer, lobbies, can also play an important role\textsuperscript{33}. This empowerment effect enlarges victims’ “power” in trial (respectively, victims’ optimism and injurer’s pessimism about trial outcome increase), and, in settlement negotiations (victims have a greater bargaining power as a group than as individuals).

Either all victims join the group and proceed by G.L., or they don’t proceed\textsuperscript{34}. Define:

- $c_V, 0 \leq c_V \leq C_V$ as the per capita victims’ litigation cost;
- $c_I, 0 \leq c_I \leq C_I$ as the injurer’s per victim litigation cost (which the injurer bears in group litigation, for every victim);
- $\kappa$ as the group transaction cost which every victim has to pay in order to collectively proceed against the injurer;
- $\rho_V > q_V$ as the victims’ subjective probability of prevailing in trial (they become more optimistic). Obviously, $0 \leq \rho_V \leq 1$;
- $\rho_I > q_I$ as the injurer’s subjective probability that victims will prevail in trial (he/she becomes more pessimistic about trial outcome). Obviously, $0 \leq \rho_I \leq 1$;
- $\alpha, 0 \leq \alpha \leq a$ as the injurer’s bargaining power in collective settlement. Consequently, victim’s bargaining power in collective settlement increases with respect to individual settlement and becomes $(1 - \alpha) \geq (1 - a)$.

\textsuperscript{32}G.L. empowers victims with respect to the individual case by reducing the “resources and skills” disproportion between the parties in approaching litigation. Not only economic resources, but also know-how and time, cultural, physical and psychological resources that are necessary to bring a lawsuit.

\textsuperscript{33}See Hesler and Pace (2000). About collective actions in general, see Olson (1971).

\textsuperscript{34}Some forms of group litigation are “non-consensual”. As in case of US class action, every victim who is covered by class definition is automatically included in the group. Under other forms of group litigation, victims have to “opt in” to the group, otherwise they are excluded. In our model the victims are equal and representative. If collectively proceeding is convenient for one victim, all victims will be included in the group.
2.2.1 Suit, settlement and trial

In case of accident, the group decides to proceed against the injurer only if the expected trial outcome is nonnegative, thus, if:

$$t^e_V = \rho_V h - c_V - \kappa \geq 0 \quad (9)$$

If the collective action constraint (9) holds, victims proceed against the injurer by group litigation or collective settlement. They prefer collective settlement only when the group can bargain a net per capita amount of settlement ($s - \kappa$) greater than the net expected per capita trial outcome ($t^e_V$), thus when:

$$s - \kappa > t^e_V$$

(10)

Obviously, the injurer accepts the collective settlement agreement only if $s$ is less than his/her expected trial outcome $t^e_I = \rho_I h + c_I$, thus when:

$$s < t^e_I$$

(11)

Rearranging the (9), (10) and (11), collective settlement occurs when:

$$\frac{c_V + \kappa}{h} \leq \rho_V \leq \frac{c_V + c_I}{h} + \rho_I$$

(12)

Thus,

- If $\rho_V < \frac{c_V + \kappa}{h}$, there is no action\(^{35}\);
- If $\frac{c_V + \kappa}{h} \leq \rho_V \leq \frac{c_V + c_I}{h} + \rho_I$, parties collectively settle out of court\(^{36}\);
- If $\frac{c_V + c_I}{h} + \rho_I < \rho_V \leq 1$, parties collectively litigate.

In case of settlement (when (12) holds), the parties settle by sharing the cooperative surplus from settlement according to their bargaining power. Thus, the collective settlement amount is\(^{37}\):

$$s(\rho_V, \rho_I) = \alpha (\rho_V h - c_V) + (1 - \alpha) (\rho_I h + c_I)$$

\(^{35}\)Note that, when $c_V + \kappa \geq h$, only no action occurs.

\(^{36}\)Here let’s assume $\frac{c_V}{h} < \frac{c_I}{h} + \rho_I$. This means that per capita transaction cost is assumed to be less than the injurer’s expected outcome of the trial. Note that, if this assumption does not hold, settlement never occurs and litigation interval is reduced.

\(^{37}\)Note that, when $c_V + \kappa \geq h$ and $c_V + c_I \geq h$, only settlement occurs.

We obtain collective settlement amount from $s = t^*_V + (t^*_I - t^*_V) (1 - \alpha)$.
2.2.2 Deterrence

Also in this case, the injurer’s problem is to define the optimal level of precaution, *ex ante*, before harm occurs and before any litigation threat. Now the victims’ subjective probability of prevailing in trial is distributed with a density function \( f(\rho_V) \), with a cumulative function \( F(\rho_V) \). Random variable \( \rho_V \) is assumed to dominate, in the first order, \( q_V \).

Thus, under G.L., the potential injurer minimizes his/her expected costs (precaution cost plus expected cost in case of accident), and chooses an amount of precaution \( x_{GL}^* \), which solves:

\[
\min_x g(x) + p(x)ND_{GL}^e
\]

where, \( D_{GL}^e \) is equal to \( E(s) + E(t^*_I) \) (per victim expected cost of collective settlement plus per victim expected cost of group litigation)\(^{38}\).

\[
E(s) = \int_{cV+\kappa}^{cV+c_I+\rho_I} \tilde{f}(\rho_V)s(\rho_V)d\rho_V \tag{14}
\]

\[
E(t^*_I) = (\rho_Ih + c_I) \int_{cV+c_I+\rho_I}^1 \tilde{f}(\rho_V)d\rho_V \tag{15}
\]

The first order condition yields an amount of precaution \( x_{GL}^* \):

\[
g'(x) = -p'(x)ND_{GL}^e \tag{16}
\]

3 Group *versus* individual litigation: a comparison

Four interlinked dimensions of the problem have to be considered, in order to understand how group litigation affects deterrence. First, as seen above, victims’ individual and collective action constraints differ. Thus, group litigation affects the victims’ access to justice. Second, individual and group litigation yield different probabilities of settlement and litigation\(^{39}\). Third, settling as group or as individuals changes the settlement amount. Finally, the level of precaution chosen by the injurer changes, and consequently, the deterrent effect of tort liability changes too.

\(^{38}\) \( D_{GL}^e \) is zero when \( \rho_V < \frac{cV+\kappa}{h} \).

\(^{39}\) About procedures governing adjudication and likelihood/terms of settlement see Hay and Spier (1998).
3.1 Access to justice

As seen above, according to part of the literature, group litigation is considered as a means to guarantee effective protection of rights and access to justice for all. This is one of the major issues in the policy debate about the introduction of procedures for aggregating claimants. According to the model we find that group litigation does not always improve access to justice:

**Proposition 1** Group litigation improves access to justice when it generates savings in victim’s litigation costs greater than the group transaction cost. When this condition does not hold, group litigation can improve access to justice only if it increases victim’s optimism about trial outcome enough to compensate the larger costs due to group transaction costs.

The individual action constraint (1), and the collective action constraint (9), are compared in figure 2. [Insert Figure 2]

**Individual litigation.** We can identify two regions: a no action area where victims completely bear the damage without any compensation \( \text{no action area}_{IL} = \frac{C_V}{h} \), and an action area where victims choose to litigate or to settle \( \text{action area}_{IL} = 1 - \frac{C_V}{h} \).\(^{40}\) Note that the action area does not depend on the injurer’s litigation cost. Decreasing victim’s litigation cost and increasing damages compensation enlarge the action area\(^{41}\).

**Group litigation.** In this case too, two regions can be identified: a no action area where victims completely bear the damage without any compensation \( \text{no action area}_{GL} = \frac{c_V + \kappa}{h} \), and a collective action area where victims choose to collectively litigate in court or to collectively settle \( \text{action area}_{GL} = 1 - \frac{c_V + \kappa}{h} \).\(^{42}\) As in the individual case, the collective action area does not depend on the injurer’s litigation cost. Decreasing victim’s group-litigation cost and increasing damage compensation enlarge the action area \(^{43}\). An increase in group transaction cost \( \kappa \) reduces the action area \(^{44}\).

G.L. enlarges the action area when:

\[
C_V - c_V > \kappa \tag{17}
\]

\(^{40}\) Note that, when \( C_V > h \), simply, action never occurs.

\(^{41}\) \( \frac{\partial \text{action area}_{IL}}{\partial C_V} = 0; \quad \frac{\partial \text{action area}_{IL}}{\partial h} = -\frac{1}{h} < 0 \) and \( \frac{\partial \text{action area}_{IL}}{\partial h} = \frac{C_V}{h^2} > 0 \).

\(^{42}\) Note that, when \( \frac{c_V}{h} + \frac{\kappa}{h} > 1 \), simply, action never occurs.

\(^{43}\) \( \frac{\partial \text{action area}_{GL}}{\partial c_V} = 0; \quad \frac{\partial \text{action area}_{GL}}{\partial h} = -\frac{1}{h} < 0 \) and \( \frac{\partial \text{action area}_{GL}}{\partial h} = \frac{c_V + \kappa}{h^2} > 0 \).

\(^{44}\) \( \frac{\partial \text{action area}_{GL}}{\partial h} = -\frac{1}{h} < 0 \)
otherwise G.L. reduces the action area. Thus, when G.L. generates savings in victims’ litigation costs greater than group transaction cost, it surely enlarges access to justice for the victims. See figure 2.a.

Furthermore, it is interesting to compare the areas’ derivatives with respect to litigation costs. As seen above, increasing victims’ litigation costs negatively affect the action areas, and, in both group and individual litigation, there is the same marginal effect \( \frac{\partial (\text{action area}_{G.L.})}{\partial C_V} = \frac{\partial (\text{action area}_{I.L.})}{\partial C_V} \). In both cases, increasing damage compensation enlarges the action areas. If G.L. improves the action area ((17) holds), the same marginal change in damage compensation affects individual action area more than the collective one \( \frac{\partial (\text{action area}_{I.L.})}{\partial h} > \frac{\partial (\text{action area}_{G.L.})}{\partial h} \). Thus, a greater claim fosters access to individual action more than collective action.

As shown in the action constraints (1) and (9), the decision to proceed against the injurer depends on the victim’s expected outcome of the trial, thus, the victim’s choice depends not only on victim’s costs, but also on the victim’s belief \( q_V \), in case of individual litigation and \( V \), in case of group litigation). Roughly speaking, victim’s action depends on where, in the victim’s choice area, victim’s belief falls. For example, in both cases, when the victim is absolutely pessimistic (independently of the injurer’s belief), no action occurs. Even if (17) does not hold, group litigation can improve access to justice if it enlarges victim’s optimism enough to compensate the larger costs due to the group transaction cost\(^{45}\). In figure 2.b., this case is illustrated: the white circle represents the value assumed by \( q_V \) and the black circle the value of \( V \). According to this scenario, in case of individual litigation, victims do not proceed, but in case of G.L. they do.

### 3.2 Settlement versus litigation

From a policy perspective, another relevant issue concerns how G.L. affects the choice between settlement and litigation\(^{46}\). In recent years, policy makers have encouraged the resolution of disputes out of court. Procedures influence the likelihood of settlement or litigation, and consequently affect courts’ workload and judicial system efficiency. According to the model we find that:

**Proposition 2** For given values of victims’ probability of success in trial, group litigation enlarges the litigation area because of savings in

\(^{45}\) Let’s remember that \( \rho_V > q_V \), by assumption.

\(^{46}\) This topic is widely discussed in law and economics literature about legal procedures. For a review about the topic see Hay and Spier (1998) and Daughety and Reinganum (2005).
litigation costs. Group litigation does not enlarge litigation area when the difference between group transaction costs and injurer’s litigation cost is greater than the total saving in litigation costs. However, group litigation fosters settlement by improving injurer’s pessimism about trial outcome.

In order to verify this issue, the individual settlement condition (4) and the collective settlement condition (12) are plotted in figure 3. [Insert Figure 3]

Individual litigation. The action area can be divided into an individual litigation area \( (IL = \frac{1}{h} (1 - \frac{C_V + C_l}{h}) (1 - \frac{C_V + C_l}{h}) ) \), where victims and injurer litigate in front of a judge and an individual settlement area \( (IS = \frac{C_l}{h} + \frac{1}{2} (1 - \frac{C_V + C_l}{h}) (1 + \frac{C_V + C_l}{h}) ) \) where parties bargain a settlement and resolve the dispute out of court. When \( C_V + C_l > h \), litigation occurs, but the individual settlement area is always greater than the individual litigation area \( (IS > IL) \). Increasing victim’s litigation cost, by reducing the action area, reduces both the individual litigation area and the settlement area. When the injurer’s litigation cost increases, the litigation area shrinks and the settlement area expands by the same amount \( (Figure 3.a) \).

Group litigation. Also in this case, the action area can be divided into a group litigation area \( (GL) \) and a collective settlement area \( (GS) \). Two cases have to be distinguished:

1) When \( \kappa \leq c_l \) (Figure 3.b)
\[
GL = \frac{1}{2} (1 - \frac{C_V + c_l}{h}) (1 - \frac{C_V + c_l}{h}) \\
GS = \frac{1}{2} (1 - \frac{C_V + c_l}{h}) (1 + \frac{C_V + c_l}{h}) + c_l - \kappa \\
\]
2) When \( \kappa > c_l \) (Figure 3.c)
\[
GL = \frac{1}{2} (1 - \frac{C_V + c_l}{h}) (1 - \frac{C_V + c_l}{h}) - \frac{1}{2} (\frac{\kappa - c_l}{h})^2 \\
GS = \frac{1}{2} (1 - \frac{C_V + c_l}{h}) (1 + \frac{C_V + c_l}{h}) + \frac{1}{2} (\frac{\kappa - c_l}{h})^2 - \frac{\kappa - c_l}{h} \\
\]
The collective settlement area is not always greater than the group litigation area. When \( \kappa \leq c_l \), \( GS > GL \), always. When \( \kappa > c_l \), \( GS > GL \), if \( \kappa - c_l < C_V + c_l \). As in the case of individual litigation, increasing victim’s litigation cost reduces both the group litigation area and the collective settlement area.\[51\] When the injurer’s litigation cost

\[50\]
\[
\text{If } C_V + C_l \leq h, \text{ litigation never occurs.} \\
\frac{dIL}{dC_V} = -\frac{1}{h} (h - (C_V + C_l)) < 0, \text{ otherwise, when } C_V + C_l \geq h, \text{ litigation does not occur, at all.} \\
\frac{dIS}{dC_V} = -\frac{1}{h} (C_V + C_l) < 0 \\
\frac{dIL}{dC_l} = -\frac{1}{h} (h - (C_V + C_l)) < 0, \text{ otherwise, when } C_V + C_l \geq h, \text{ litigation does not occur.} \\
\frac{dIS}{dC_l} = \frac{1}{h} (h - (C_V + C_l)) > 0, \text{ otherwise when } (C_V + C_l) \geq h, \text{ all the action area is a settlement area.} \\
\frac{dGS}{dC_V} = -\frac{1}{h} (h - (C_V + c_l)) < 0, \text{ in fact, when } c_V + c_l \geq h, \text{ group litigation does not occur at all.} \\
\frac{dGS}{dC_l} = -\frac{1}{h} (c_V + c_l) < 0.
\]
increases, the litigation area shrinks and the settlement area expands by the same amount.\footnote{When \( \kappa \leq c_I \), \( \frac{\partial GL}{\partial c_I} = -\frac{1}{h^2} (h - (c_V + c_I)) < 0 \), (in fact, if \( (c_V + c_I) \geq h \), group litigation does not occur, at all), \( \frac{\partial GS}{\partial c_I} = \frac{1}{h^2} (h - (c_V + c_I)) \geq 0 \), in fact, if \( (c_V + c_I) \geq h \), collective settlement-area is largest as possible. When \( \kappa > c_I \), \( \frac{\partial GL}{\partial c_I} = -\frac{1}{h^2} (h - (c_V + \kappa)) < 0 \), \( \frac{\partial GS}{\partial c_I} = \frac{1}{h^2} (h - (c_V + \kappa)) > 0 \), (in fact, if \( c_V + \kappa \geq h \), action does not occur at all).}

Group transaction cost \( \kappa \) affects the choice between collective settlement and group litigation. It negatively affects the group litigation area when \( \kappa > c_I \), otherwise it does not affect the group litigation area. An increase in the group transaction cost always reduces the collective settlement area. The intuition is that a larger group transaction cost drives up the minimum settlement amount which victims can accept and thus, settling becomes less attractive for the injurer (recall that the injurer does not bear \( \kappa \), instead, victims bear \( \kappa \) in any case).

Comparing G.L. with respect to the individual litigation benchmark, note that, for the same access to justice (that is, for the same action area): If \( \kappa \leq c_I \), the group litigation area is always larger than the individual litigation area \( (GL \geq IL) \), and obviously, the collective settlement area is always smaller than the individual settlement area \( (GS \leq IS) \).\footnote{When \( \kappa \leq c_I \), \( GL \geq IL \), \( I \geq S \). When \( \kappa > c_I \), \( GS \leq IS \).}

If \( \kappa > c_I \), the group litigation area is not necessarily larger than the individual litigation area \( (GL \not\geq IL) \). In fact, when \( \kappa - c_I \) is larger than the total saving in litigation costs due to G.L., the group litigation area is smaller than the individual litigation area.\footnote{When \( \kappa > c_I \), \( GL < IL \) if \( (1 - \frac{C_V + C_I}{h})^2 > (1 - \frac{C_V + C_I}{h})^2 \) \( \leq (1 - \frac{C_V + C_I}{h})^2 \) thus, if \( (C_V + C_I) - (c_V + c_I) < \kappa - c_I \).}

Some further comments follow by comparing group and individual areas’ derivatives with respect to litigation costs. The same marginal decrease in victim’s litigation cost, enlarges the group litigation area more than the individual litigation area \( \left( \left| \frac{\partial GL}{\partial c_V} \right| \leq \left| \frac{\partial IL}{\partial c_V} \right| \right) \). Vice versa, the same change in victim’s litigation cost affects the individual settlement area more than the collective settlement area \( \left( \left| \frac{\partial IS}{\partial c_V} \right| \geq \left| \frac{\partial GS}{\partial c_V} \right| \right) \).

Changes in injurer’s litigation cost generate a sort of substitution effect between settlement and litigation, both in the individual case and in the group one. The same marginal decrease in injurer’s litigation cost,

\[ \frac{\partial GL}{\partial c_I} = -\frac{1}{h^2} (h - (c_V + c_I)) < 0, \text{ (in fact, if } (c_V + c_I) \geq h, \text{ group litigation does not occur, at all)}, \]

\[ \frac{\partial GS}{\partial c_I} = \frac{1}{h^2} (h - (c_V + c_I)) \geq 0, \text{ (in fact, if } (c_V + c_I) \geq h, \text{ collective settlement-area is largest as possible). When } \kappa > c_I \]

\[ \frac{\partial GL}{\partial c_I} = -\frac{1}{h^2} (h - (c_V + \kappa)) < 0, \frac{\partial GS}{\partial c_I} = \frac{1}{h^2} (h - (c_V + \kappa)) > 0, \text{ (in fact, if } c_V + \kappa \geq h, \text{ action does not occur at all).} \]
enlarges the group litigation area more than the individual litigation area \( \left| \frac{\partial IL}{\partial C_I} \right| \leq \left| \frac{\partial GL}{\partial C_I} \right| \), and symmetrically, reduces the collective settlement area more than the individual settlement area \( \left| \frac{\partial IS}{\partial C_V} \right| \geq \left| \frac{\partial GS}{\partial C_V} \right| \).

As explained about the probability of action, probabilities of settlement and litigation do not depend only on the costs. They also depend on parties’ subjective beliefs about trial outcome. For every value of \( q_V > \frac{C_V}{h} \) in the individual case, and \( \rho_V > \frac{C_V}{h} + \frac{\kappa}{h} \) in the group case, when parties’ beliefs converge, settlement always occurs (see in Figure 3, that the 45° lines lie in the settlement area). When both the victims and the injurer are optimistic \( (q_V/\rho_V \text{ high and } q_I/\rho_I \text{ low}) \), litigation occurs. Finally, note that, when the injurer is pessimistic and the victims proceed, settlement easily occurs. As seen above, group litigation can facilitate the victims’ proceeding and makes the injurer more pessimistic \( (\rho_I > q_I) \). Thus, group litigation may enhance settlement.

3.3 Settlement amount

Exploring how individual and group litigation may affect settlement, we find that the terms of settlement change depending on which litigation procedure is applied.

**Proposition 3** Group litigation enlarge the amount settled by parties through its victims’ empowerment effect and scale economies in victims’ litigation cost. Instead, group litigation reduce the settlement amount by reducing the injurer’s litigation cost. The maximum amount individually negotiable is greater than the maximum amount negotiable by the group. The minimum amount which victims can obtain as individuals is smaller than the minimum collectively negotiable amount.

As shown in the model (see subsection 2.1.1 and 2.2.1), the settlement amount depends on several variables which affect settlement negotiations in a contrasting way. Comparing the individual settlement amount (5) and the collective one (13) is not easy. However, individual and collective settlement amounts are defined in the same way, and several interesting results are revealed by analyzing settlement amounts’ derivatives.

An increase in the injurer’s bargaining power reduces the settlement amount, while an increase in the victim’s bargaining power increases the settlement amount\(^{57}\). Recall that, in case of G.L., the injurer has a lower
bargaining power than under individual litigation \((\alpha \leq a)\). Symmetrically, victims settling as a group have a larger bargaining power.

Both in individual and collective settlement, when the subjective probabilities that victims (as individuals or as a group) will prevail in trial increase, the settlement amount increases. A more pessimistic injurer and a more optimistic victim settle for a larger amount. Furthermore, G.L. makes the injurer more pessimistic and victims more optimistic. A marginal increase in victim’s optimism enlarges the individual settlement amount more than the collective settlement amount \(\frac{\partial S}{\partial q_V} > \frac{\partial s}{\partial q_V}\). Vice versa, a marginal increase in the injurer’s pessimism increases the individual settlement by a smaller amount than the collective one \(\frac{\partial S}{\partial q_I} \leq \frac{\partial s}{\partial q_I}\).

In both cases, victims’ and injurer’s litigation costs have opposite effects on the settlement amount: when the victim’s litigation cost increases, the settlement amount decreases, and, when the injurer’s litigation cost increases, the settlement amount increases. The intuition is that the injurer has some interest in saving litigation cost and the higher his/her litigation cost, the higher the amount he/she is inclined to pay. Symmetrically, victims have some interest in saving litigation costs, and thus, the higher their litigation cost, the better they consider even a small settlement amount.

Furthermore, a marginal increase in victims’ litigation cost, when they bargain individually, reduces the settlement amount more than when they bargain as a group \(\frac{\partial S}{\partial C_V} > \frac{\partial s}{\partial C_V}\). Conversely, a marginal increase in the litigation cost of the injurer increases the individual settlement amount less than the collective settlement amount \(\frac{\partial S}{\partial C_I} \leq \frac{\partial s}{\partial C_I}\).

An increasing amount of damage compensation obviously enlarges the amount for which the parties settle. Marginal increases depend on the parties’ bargaining power \(\frac{\partial S}{\partial h} \leq \frac{\partial s}{\partial h}\). The group transaction cost does not affect the collective settlement amount. Finally, we have to consider that the maximum amount individually negotiable \((S(1, 1, a=0) = h + C_I)\) is greater than the maximum amount negotiable by the group \((s(1, 1, \alpha=0) = h + c_I)\). Instead, the minimum amount which the victim can obtain as an individual \((S(C_V h, 0, a=1) = 0)\) is smaller than the

\[\frac{\partial s}{\partial h} = a \rho + (1-a) q_I; 0\]

\[\frac{\partial S}{\partial h} = a h \rho - c_I - c_V - h \rho_I \text{ and settlement occurs only when } \frac{c_I}{h} + \frac{c_V}{h} \leq \rho_V \leq \frac{c_I}{h} + \frac{c_V}{h} + \rho_I. \text{ Thus, collective settlement amount’s derivative with respect to the injurer’s bargaining power is always less than (or equal to) zero. } (\frac{\partial s}{\partial h} \rightarrow (k - (h \rho_I + c_I); 0))

\[\frac{\partial s}{\partial q_V} = \alpha h \geq 0; \frac{\partial S}{\partial q_V} = (1-\alpha) h \geq 0. \frac{\partial s}{\partial q_I} = \beta h \geq 0; \frac{\partial S}{\partial q_I} = (1-\beta) h \geq 0.

\[\frac{\partial S}{\partial C_V} = -a \leq 0 \text{ and } \frac{\partial s}{\partial C_V} = + (1-a) \geq 0. \frac{\partial s}{\partial C_I} = -\alpha \leq 0 \text{ and } \frac{\partial S}{\partial C_I} = + (1-\alpha) \geq 0. \text{ Derivatives with respect to litigation costs have opposite sign and, like previsions, derivatives depend on the parties’ bargaining power.}

\[\frac{\partial S}{\partial h} = a q + (1-a) q_I; 0. \frac{\partial s}{\partial h} = a \rho + (1-a) \rho_I \geq 0.\]
minimum collectively negotiable amount \( s(\frac{c_I}{h} + \frac{c_V}{h}, \rho_I, \alpha=1) = \kappa \).

3.4 Deterrence

We have demonstrated how G.L. affects the probability of action against the injurer, the probability of litigation and the probability and terms of settlement. Now, in order to understand how group litigation affects deterrence, consider the resulting level of precaution chosen by the injurer.

As seen in Subsections 2.1.2 and 2.2.2, the injurer’s problem is to define the optimal level of precaution \( x^*_I \), \textit{ex ante}, before harms occurs and before any litigation threat.

We compare \( x^*_IL(D^eI) \) in (8) and \( x^*_GL(D^eGL) \) in (16) to determine whether group litigation results in a larger amount of precaution than individual litigation. Note that the first derivative of \( x^*_I \) with respect to \( D^eI \) is positive \( \frac{dx^*}{dD^eI} = \frac{-Np'(x^*)}{g'(x^*)+Np''(x^*)D^eI} > 0 \)^{61} thus in order to compare the different level of care it is sufficient to compare \( D^eI \) with \( D^eGL \). Evidently, \( D^eI \) is equal to \( D^eGL \), when scale economies, group transaction cost, and victim’s empowerment effect don’t exist \( (C_I = c_I \text{ and } C_V = c_V , \kappa = 0, q_I = \rho_I, \rho_V \sim f(q_V), a = a) \). Thus, we need to examine how litigation costs, group transaction cost, beliefs, and bargaining power affect \( D^eGL \).

3.4.1 Litigation and group transaction costs

According to the model we find that:

**Proposition 4** Scale economies in victims’ litigation costs due to group litigation enlarge deterrence. Scale economies in the injurer’s litigation cost and group transaction costs borne by victims due to group litigation reduce the deterrent effect of tort liability.

The victims’ litigation cost has an ambiguous effect on the cost of settlement expected by the injurer. In fact, an increasing victim’s litigation cost enlarges the settlement amount, but also reduces the likelihood of settlement by reducing the action area \( \frac{\partial E(s)}{\partial c_V} \leq 0 \). Conversely, an increase in the victim’s litigation cost reduces the cost of litigation expected by the injurer \( \frac{\partial E(t^*_I)}{\partial c_V} \leq 0 \). Finally, an increase in victim’s litigation cost reduces the expected cost in case of accident \( \frac{\partial D^eGL}{\partial c_V} \leq 0 \).

---

^{61}This result is obtained by a total differentiation of \( g'(x^*) = -Np'(x^*)D^eI \).

\[
g''(x^*(D^eI)) \cdot \frac{dx^*}{dD^eI} = -Np'' \left( x^* \left( D^eI \right) \right) \cdot \frac{dx^*}{dD^eI} \cdot D^eI - Np' \left( x^* \left( D^eI \right) \right)
\]

\[
\frac{dx^*}{dD^eI} = \frac{-Np'(x^*)}{g'(x^*)+Np''(x^*)D^eI} > 0.
\]
Thus, if group litigation guarantees scale economies in victims’ litigation cost, it enlarge deterrence.

On the contrary, the injurer’s litigation cost unambiguously affects the expected cost of settlement: an increase in the injurer’s litigation cost enlarges the expected cost of settlement ($\frac{\partial E(s)}{\partial cI} \geq 0$). Instead, the injurer’s litigation cost has an ambiguous effect on the expected cost of litigation ($\frac{\partial E(t_I)}{\partial cI} \geq 0$). In fact, it enlarges the injurer’s expected trial outcome ($t_I^*$), but it also reduces the litigation likelihood. However, the total effect is clear: a decreasing injurer’s litigation cost reduces deterrence ($\frac{\partial D_{eGL}}{\partial cI} \geq 0$). This means that, group litigation reduces the deterrent effect of liability by savings in injurer’s litigation cost.

Group transaction cost $\kappa$ reduces settlement likelihood and does not affect the settlement amount. It reduces the total expected settlement cost and thus deterrence ($\frac{\partial E(s)}{\partial \kappa} < 0$). Instead, the group transaction cost does not affect the total expected litigation costs ($\frac{\partial E(t_I)}{\partial \kappa} = 0$). Finally, the group transaction cost negatively affects deterrence ($\frac{\partial D_{eGL}}{\partial \kappa} = \frac{\partial E(s)}{\partial \kappa} < 0$). Details about this subsection are in the Appendix, A.1.

3.4.2 Victims’ empowerment effect

As seen above, group litigation empowers victims. Victims become more confident about a favorable outcome in trial, the injurer considers more likely to be held liable and finally, the parties’ relative bargaining power changes in favour of victims. According to the model we find that:

**Proposition 5** Group litigation enlarges deterrence by reducing the injurer’s optimism about trial outcome and his/her bargaining power. The enlarged victim’s optimism due to group litigation empowerment effect ambiguously affects deterrence.

In order to understand how the injurer’s belief affects deterrence, examine the partial derivatives of the expected cost of settlement, the expected cost of litigation, and the expected cost of accident, with respect to $\rho_I$. It’s easy to see that an increase in the injurer’s pessimism, enlarges the expected cost of settlement ($\frac{\partial E(s)}{\partial \rho_I} > 0$). Conversely, the effect on the expected cost of litigation is ambiguous because an increased injurer’s pessimism enlarges the expected trial outcome ($t_I^*$) and reduces litigation likelihood. However the total effect on the expected cost of accident is positive ($\frac{\partial D_{eGL}}{\partial \rho_I} > 0$). Thus, from a deterrence perspective, the augmented injurer’s pessimism due to G.L. enlarges the deterrent effect of liability.

In order to understand how G.L. affects $D_{e(t)}$, by changing victims’ belief, the expected cost of settlement, the expected cost of litigation,
and finally, the expected cost of accident, are compared by assuming that $c_V = C_V$, $c_I = C_I$, and $q_I = \rho_I$, $\kappa = 0$. Note that the probabilities' thresholds are the same. The enlarged victims' optimism generated by G.L. (and the changed distribution of victims' belief) ambiguously affects the expected cost of settlement ($\bar{E}(s) \geq \bar{E}(S)$). Instead it positively affects the expected cost of litigation by increasing the litigation likelihood ($\bar{E}(t_I) \geq \bar{E}(T_I)$). In this case, the total effect on deterrence is ambiguous ($\bar{D}_{GL} \geq \bar{D}_{IL}$).

Finally, consider the parties' bargaining power. In the collective settlement, the victims' empowerment, and the resulting reduced injurer's bargaining power, improve deterrence by increasing the expected cost of settlement ($\frac{\partial E(s)}{\partial \alpha} \leq 0$, $\frac{\partial E(t)}{\partial \alpha} = 0$, $\frac{\partial D_{GL}}{\partial \rho_I} = \frac{\partial E(s)}{\partial \rho_I} \leq 0$). Details about this subsection are in the Appendix, A.2.

4 Conclusions

The model analyzes variables characterizing group litigation and their impact on access to justice, dynamics of litigation and settlement, and deterrence. The main finding is that group litigation does not always improve deterrence. In fact, key variables affect deterrence in different, and often contrasting ways. The model shows that group litigation improve deterrence by reducing the victims' litigation costs and increasing their bargaining power. Furthermore, the model suggests that group transaction costs and scale economies in injurer's litigation cost reduce deterrence.

It is of primary interest to consider the parties' costs and power according to the specific legal policy priorities and the context of application (litigation costs allocation rules, possible empowerment effects, group organization and related transaction costs, etc.). This might allow us to evaluate existing forms of group litigation or to debate the suitability of a new procedural device for collective action from a deterrence perspective.

Furthermore, group litigation can enlarge effective rights protection by improving access to justice when it guarantees sufficient scale economies or sufficient empowerment of victims. Instead, high group transaction costs can limit the group litigation benefit of a wider access to justice. Finally, the model suggests that group litigation affects settlement terms and likelihood.

Finally, a possible extension to the model is to consider heterogeneity of victims. Different victims might have different incentives to proceed as a group or as individuals, and to settle or litigate. For example, groups may suffer the usual problems of adverse selection and free riding (see Che (1996), Che and Yi (1993)). Furthermore, in environments with
heterogenous victims (see Daughety and Reinganum (1999) and Spier (2003)), collective settlement may become a particularly valuable tool to solve disputes.
References


[16] Deffains B.; Langlais E.; Doriat-Duban M.; 2005; Information Sharing in Class Action Suits. Available at SSRN:


[22] Giussani A.; 1996; Studi sulla Class Action; Cedam, Padova.


Vol. 11; pp. 405-421.


Appendix

Recall that the injurer expects a per victim cost of collective settlement:

\[ E(s) = \int \frac{e^{cV+s} + \rho I}{e^{cV+s} + \rho I} f(\rho_V) s(\rho_V) d\rho_V \]

It can be rewritten as:

\[ E(s) = ((1 - \alpha) \rho_I h + (1 - \alpha) c_I - \alpha c_V) \left( \tilde{F} \left( \frac{cV+\alpha}{h} \right) + \tilde{F} \left( \frac{cV+\kappa}{h} \right) \right) + \]

\[ + \alpha h \int \frac{e^{cV+s} + \rho I}{e^{cV+s} + \rho I} f(\rho_V) \rho_V d\rho_V \]

The injurer’s per victim expected cost of group litigation is:

\[ E(t_I^*) = (\rho_I h + c_I) \int \frac{1}{e^{cV+s} + \rho I} f(\rho_V) d\rho_V = (\rho_I h + c_I) \left( 1 - \tilde{F} \left( \frac{cV+\alpha}{h} + \rho_I \right) \right) \]

In G.L., the per victim expected cost of accidents for the injurer is:

\[ D_{GL}^e = E(s) + E(t_I^*) \]

A.1 Proposition 4

- The derivative of \( E(s) \) with respect to \( c_V \) is:

\[
\frac{dE(s)}{dc_V} = -\alpha \left( \tilde{F} \left( \frac{cV+\alpha}{h} + \rho_I \right) - \tilde{F} \left( \frac{cV+\kappa}{h} \right) \right) + \\
+ \alpha h \left( \tilde{F} \left( \frac{cV+\alpha}{h} + \rho_I \right) + \frac{1}{h} \left( \tilde{f} \left( \frac{cV+\alpha}{h} + \rho_I \right) - \tilde{f} \left( \frac{cV+\kappa}{h} \right) \right) \right) + \\
+ \frac{dE(s)}{dc_V} = \alpha \left( \tilde{F} \left( \frac{cV+\alpha}{h} + \rho_I \right) - \tilde{F} \left( \frac{cV+\kappa}{h} \right) \right) + \\
+ \tilde{f} \left( \frac{cV+\alpha}{h} + \rho_I \right) \left( \rho_I - \alpha \rho_I + \frac{c_I}{h} - \alpha \frac{c_V}{h} \right) + \\
+ \tilde{f} \left( \frac{cV+\alpha}{h} + \rho_I \right) \left( \alpha \frac{c_V}{h} + \alpha \frac{c_V}{h} + \alpha \frac{c_V}{h} - \alpha \frac{c_V}{h} \right) + \\
+ \tilde{f} \left( \frac{cV+\alpha}{h} + \rho_I \right) \left( 1 - \alpha \right) \left( \rho_I + \frac{c_I}{h} + \alpha \frac{c_V}{h} \right) \geq 0 \\
\]

- The derivative of \( E(t_I^*) \) with respect to \( c_V \) is:

\[
\frac{dE(t_I^*)}{dc_V} = -\left( \rho_I + \frac{c_I}{h} \right) \tilde{f} \left( \frac{cV+\alpha}{h} + \rho_I \right) \leq 0 \\
\]

- The derivative of \( D_{GL}^e \) with respect to \( c_V \) is:
The derivative of $E(s)$ with respect to $c_I$ is:

$$\frac{dE(s)}{dc_I} = (1 - \alpha) \left( \tilde{F}(\frac{c_I + c_I}{h} + \rho_I) - \tilde{F}(\frac{c_I}{h}) \right) +$$

$$+ (1 - \alpha) (\rho_I h + (1 - \alpha) c_I - \alpha c_V) \tilde{f}(\frac{c_I + c_I}{h} + \rho_I) \frac{1}{h} +$$

$$+ \alpha h(\frac{c_I + c_I}{h} + \rho_I) \tilde{f}(\frac{c_I + c_I}{h} + \rho_I) \frac{1}{h}$$

$$\frac{dE(s)}{dc_I} = (1 - \alpha) \left( \tilde{F}(\frac{c_I + c_I}{h} + \rho_I) - \tilde{F}(\frac{c_I}{h}) \right) +$$

$$+ \tilde{f}(\frac{c_I + c_I}{h} + \rho_I) (\rho_I - \alpha \rho_I + c_I \frac{h}{c_I} - \alpha c_I \frac{h}{c_I} - \alpha c_V \frac{h}{c_I} + \alpha c_V \frac{h}{c_I} + \alpha c_I \frac{h}{c_I} + \alpha \rho_I)$$

$$\frac{dE(s)}{dc_I} = (1 - \alpha) \left( \tilde{F}(\frac{c_I + c_I}{h} + \rho_I) - \tilde{F}(\frac{c_I}{h}) \right) +$$

$$+ \tilde{f}(\frac{c_I + c_I}{h} + \rho_I) (\rho_I + \alpha \rho_I) \geq 0$$

The derivative of $E(t_f)$ with respect to $c_I$ is:

$$\frac{dE(t_f)}{dc_I} = (1 - \tilde{F}(\frac{c_I + c_I}{h} + \rho_I)) - (\rho_I h + c_I) \tilde{f}(\frac{c_I + c_I}{h} + \rho_I) \frac{1}{h}$$

$$\frac{dE(t_f)}{dc_I} = (1 - \tilde{F}(\frac{c_I + c_I}{h} + \rho_I)) - (\rho_I + \frac{c_I}{h}) \tilde{f}(\frac{c_I + c_I}{h} + \rho_I) \geq 0$$

The derivative of $D^e_{GL}$ with respect to $c_I$ is:

$$\frac{dD^e_{GL}}{dc_I} = \frac{dE(s)}{dc_I} + \frac{dE(t_f)}{dc_I}$$

$$\frac{dD^e_{GL}}{dc_I} = (1 - \alpha) \left( \tilde{F}(\frac{c_I + c_I}{h} + \rho_I) - \tilde{F}(\frac{c_I}{h}) \right) +$$

$$+ (1 - \tilde{F}(\frac{c_I + c_I}{h} + \rho_I)) \geq 0$$

The derivative of $E(s)$ with respect to $\kappa$ is:

$$\frac{\partial E(s)}{\partial \kappa} = -\tilde{f}(\frac{c_I + \kappa}{h}) ((1 - \alpha) \rho_I + (1 - \alpha) \frac{c_I}{h} + \alpha \frac{\kappa}{h}) < 0$$

The derivative of $E(t_f)$ with respect to $\kappa$ is:

$$\frac{\partial E(t_f)}{\partial \kappa} = 0$$

The derivative of $D^e_{GL}$ with respect to $\kappa$ is:

$$\frac{dD^e_{GL}}{d\kappa} = \frac{dE(s)}{d\kappa}$$
A.2 Proposition 5

- The derivative of $E(s)$ with respect to $\rho_I$ is:

$$
\frac{dE(s)}{d\rho_I} = (1 - \alpha) h \left( \tilde{F}(\frac{c_v + c_I}{h} + \rho_I) - \tilde{F}(\frac{c_v + \kappa}{h}) \right) + \\
+ (1 - \alpha) \rho_I h + (1 - \alpha) c_I - \alpha c_V) \tilde{f}(\frac{c_v + c_I}{h} + \rho_I) (1) + \\
+ \alpha h \tilde{f}(\frac{c_v + c_I}{h} + \rho_I) \left( \frac{c_v + c_I}{h} + \rho_I \right)
$$

$$
\frac{dE(s)}{d\rho_I} = (1 - \alpha) h \left( \tilde{F}(\frac{c_v + c_I}{h} + \rho_I) - \tilde{F}(\frac{c_v + \kappa}{h}) \right) + \\
+ \tilde{f}(\frac{c_v + c_I}{h} + \rho_I) (\rho_I h - \alpha \rho_I h + c_I - \alpha c_I - \alpha c_V + \alpha c_V + \alpha c_I + \alpha \rho_I)
$$

$$
\frac{dE(s)}{d\rho_I} = (1 - \alpha) h \left( \tilde{F}(\frac{c_v + c_I}{h} + \rho_I) - \tilde{F}(\frac{c_v + \kappa}{h}) \right) + \\
+ \tilde{f}(\frac{c_v + c_I}{h} + \rho_I) (\rho_I h + c_I) > 0
$$

- The derivative of $E(t_f^e)$ with respect to $\rho_I$ is:

$$
\frac{dE(t_f^e)}{d\rho_I} = h \left( 1 - \tilde{F}(\frac{c_v + c_I}{h} + \rho_I) \right) - \left( \rho_I h + c_I \right) \tilde{f}(\frac{c_v + c_I}{h} + \rho_I) (1) \\
\frac{dE(t_f^e)}{d\rho_I} = h \left( 1 - \tilde{F}(\frac{c_v + c_I}{h} + \rho_I) \right) - \left( \rho_I h + c_I \right) \tilde{f}(\frac{c_v + c_I}{h} + \rho_I) \leq 0
$$

- The derivative of $D_{GL}^e$ with respect to $\rho_I$ is:

$$
\frac{dD_{GL}^e}{d\rho_I} = \frac{dE(s)}{d\rho_I} + \frac{dE(t_f^e)}{d\rho_I} \\
\frac{dD_{GL}^e}{d\rho_I} = (1 - \alpha) h \left( \tilde{F}(\frac{c_v + c_I}{h} + \rho_I) - \tilde{F}(\frac{c_v + \kappa}{h}) \right) + \\
+ \tilde{f}(\frac{c_v + c_I}{h} + \rho_I) (\rho_I h + c_I) + h \left( 1 - \tilde{F}(\frac{c_v + c_I}{h} + \rho_I) \right) + \\
- \tilde{f}(\frac{c_v + c_I}{h} + \rho_I) (\rho_I h + c_I)
$$

$$
\frac{dD_{GL}^e}{d\rho_I} = (1 - \alpha) h \left( \tilde{F}(\frac{c_v + c_I}{h} + \rho_I) - \tilde{F}(\frac{c_v + \kappa}{h}) \right) + \\
+ h \left( 1 - \tilde{F}(\frac{c_v + c_I}{h} + \rho_I) \right) > 0
$$

$$
\frac{dD_{GL}^e}{d\rho_I} = h \left( 1 - \left( \alpha \tilde{F}(\frac{c_v + c_I}{h} + \rho_I) + (1 - \alpha) \tilde{F}(\frac{c_v + \kappa}{h}) \right) \right) > 0
$$

- As explained in the text, in order to understand how changes in victims’ beliefs affect expected per capita cost of settlement, expected per capita cost of litigation, and finally, expected accident cost, we compare $\overline{E}(s)$ and $\overline{E}(S)$, $E(t_f^e)$ and $E(T_f^e)$, $D_{GL}^e$ and $\overline{D_{GL}}$, where $c_v = C_v$, $c_I = C_I$, and $q_I = \rho_I$, $\kappa = 0$. Note that the probabilities thresholds are the same. $E(s) \leq \overline{E}(S)$, in fact,

$$
\overline{E}(s) - \overline{E}(S) = \\
= ah \left( \int_{\frac{c_v + c_I}{h}}^{\frac{c_v + c_I}{h} + q_I} \tilde{f}(\rho_V) \rho_V d\rho_V - \int_{\frac{c_v}{h}}^{\frac{c_v + c_I}{h} + q_I} f(q_V) q_V d\rho_V \right) + \\
$$
\[-(aC_V + (1 - a)(q_I h + C_I)) * \]
\[* \left( \tilde{F}(\frac{C_V + C_I}{h} + q_I) - \tilde{F}(\frac{C_V}{h}) - F(\frac{C_V + C_I}{h} + q_I) + F(\frac{C_V}{h}) \right) \leq 0 \]

- Instead, \( \overline{E(t_I^p)} \geq \overline{E(T_I^p)} \), because

\[
\overline{E(t_I^p)} - \overline{E(T_I^p)} = (q_I h + C_I) \left( F\left(\frac{C_V + C_I}{h} + q_I\right) - \tilde{F}\left(\frac{C_V + C_I}{h} + q_I\right) \right) \geq 0
\]

- The total effect on expected accident cost is ambiguous, in fact,

\[
\overline{D_G^\epsilon} - \overline{D_{IL}^\epsilon} = \left( \overline{E(s)} - \overline{E(S)} \right) + \left( \overline{E(t_I^p)} - \overline{E(T_I^p)} \right) \geq 0.
\]

- The derivative of \( \overline{E(s)} \) with respect to \( \alpha \) is:

\[
\frac{\partial \overline{E(s)}}{\partial \alpha} = - \left( \rho_I h + c_I + c_V \right) \int_{\frac{C_V + c_I}{h} + \rho_I}^{\frac{C_V + c_I}{h}} \tilde{f}(\rho_V) d\rho_V + \frac{C_V + c_I}{h} + \rho_I
\]

\[
+ h \int_{\frac{C_V + c_I}{h}}^{\frac{C_V + c_I}{h} + \rho_I} \tilde{f}(\rho_V) \rho_V d\rho_V \leq 0
\]

- Rewriting \( \frac{\partial \overline{E(s)}}{\partial \alpha} \) as \( \int_{\frac{C_V + c_I}{h}}^{\frac{C_V + c_I}{h} + \rho_I} \tilde{f}(\rho_V) \left( \frac{c_I + c_V}{h} + \rho_I \right) - \rho_V \right) d\rho_V \), it is easy to see that the derivative is negative because \( \int_{\frac{C_V + c_I}{h}}^{\frac{C_V + c_I}{h} + \rho_I} \tilde{f}(\rho_V) \left( \frac{c_I + c_V}{h} + \rho_I \right) - \rho_V \right) d\rho_V \)

is always nonnegative. Obviously the derivative of \( \overline{E(t_I^p)} \) with respect to \( \alpha \) is \( \frac{\partial \overline{E(t_I^p)}}{\partial \alpha} = 0 \) and the derivative of \( \overline{D_G^\epsilon} \) with respect to \( \alpha \) is equal to \( \frac{\partial \overline{E(s)}}{\partial \rho_I} \), and thus negative.
Figures

**Injurer’s problem (deterrence):**

- Choice of the optimal precaution amount ($x$)
- Accident ($\rho$)
- No accident ($1-\rho$)

**Access to justice:**

- Access to justice: $C_V - C_V > \kappa$
- Access to justice: $C_V - C_V < \kappa$

**Figure 1**

**Figure 2**
Litigation vs settlement:

Figure 3