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The duty to mitigate in tort law

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The duty to mitigate in tort law

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Abstract

The duty to mitigate is a widely accepted rule in contract law, according to which the victim of a contractual breach cannot obtain compensation for a loss that she could easily have avoided. However, the mitigation principle is rarely applied in tort law. We investigate the impact of the duty to mitigate in tort law, under a strict liability regime and under a negligence rule. In each case, we study the effect of the mitigation rule on the injurer's incentives to invest in care *ex ante* in order to reduce the probability that an accident will occur, on the one hand; and on the victim's incentives to invest in cost-minimizing efforts *ex post* in order to reduce the magnitude of the harm, on the other hand. We first show that when mitigation costs are perfectly verifiable, a duty to mitigate always leads to the optimal incentives. However, the introduction of such a duty is not always welfare-enhancing when mitigation costs are imperfectly verifiable.

1 Introduction

Consider a pedestrian who is hit by a car and refuses to undergo surgery because of a personal trauma. Doctors however strongly recommend surgery, which is estimated to have a high probability of success. Should the victime be fully compensated for her prejudice, in spite of her refusal to follow medical advice? Consider now another pedestrian who is also hit by a car and is therefore unable to operate her business for several months. Should the driver be liable for the entire financial loss suffered by the victim of the accident? Should one consider that the pedestrian could have taken reasonable measures to limit her loss, such as for instance entrusting a third party with the exploitation of her business?

Both examples raise the issue of the victim's duty to mitigate after the damage has been caused. The first example mentioned above is inspired by the *Janiak*[1] case ruled by the Supreme Court of Canada. The latter had to decide on the damages allocated to a victim who refused surgery after a motor vehicle accident. The trial judge found the plaintiff was unreasonable in his refusal of the surgery (which had a 70% chance of success), and therefore only awarded damages until the time that the victim would have been able to return to work, had he undergone the surgery. The Supreme Court of Canada followed the argument and upheld that result, although mitigation, which implied going through surgery, could have been considered has an infringement on the victim's body integrity. The second example describes the case which was ruled on 19 June 2003 by the French Supreme Court. In this case, the *Cour de Cassation* considered that the victim was entitled to obtain full compensation for the prejudice she had suffered, regardless of her behavior after the damage had occurred.[2] In this instance, simple measures could however have been implemented to reduce the consequences of the accident. These two examples illustrate the significant divergence of assessment of the mitigation principle, depending on the country and on the specificities of the case.

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[1]Janiak v Ippolito [1985] 1 SCR 146.
[2]See *Cour de Cassation*, 19 June 2003, n 00-22.302 and n 01-13.289

In this paper, we propose a simple model to explore the economic efficiency of the duty to mitigate in tort law. To specify the mitigation principle, three remarks are in order. First, the mitigation principle can actually refer to two slightly different situations: the requirement that the victim take reasonable steps to reduce her prejudice is the broader acceptance of the concept; a more narrow vision consists in imposing upon the victim a duty to avoid aggravating the damage. Although the distinction is theoretically relevant, it is hard in practice to draw a firm line between the two concepts. Hence, in what follows, we will use the term 'duty to mitigate' to refer to the broader acceptance, that is the obligation of the victim to reduce her loss, which implies but is not limited to the obligation to avoid aggravating it. Second, the term *"duty to mitigate"* is misleading since the failure to mitigate does not constitute an actual fault, but only disables the injured party to obtain full compensation.[3] Last, mitigation differs from the standard bilateral accident framework regarding the timing of events. In a bilateral accident, the victim's negligence intervenes *ex ante*, before the accident occurs; while the duty to mitigate focuses on the victim's behavior *ex post*, after the damage has been caused. However, in both cases, the victim can ultimately have an impact on the average amount of her own prejudice.[4]

Our paper is first related to the literature on the duty to mitigate. In their seminal article entitled *'The Mitigation Principle: toward a General Theory of Contractual Obligation'*, Goetz & Scott (1983) assert that *"the duty to mitigate is a universally accepted principle of contract law, requiring that each party exert reasonable efforts to minimize losses whenever intervening events impede contractual objectives"*. In the same line of thought, Bebchuk & Shavell (1991) argue that *'when a buyer can reduce his losses by doing something after a breach, the courts normally impose a duty to mitigate losses on him'*. It is striking that these authors all focus on mitigation in contract law, which reflects the general trend in the economic literature.[5] Indeed, the mitigation rule in tort law has drawn much less attention among courts as well as scholars. Endres & Friehe (2015) offer a notable exception, by focusing on clean-up costs in the case of environmental harm. The authors consider a variety of liability regime, depending on whether compensation is based on the level of harm, on the clean-up costs incurred by the victim or on a combination of both. They conclude that none of the compensatory regimes used in practice is efficient, and that they all lead to some kind of distorsion. The issue tackled by Endres & Friehe (2015) is very close to our focus since clean-up activities can be a form of mitigation. However, mitigation is more vast than clean up activities, as it is not limited to environmental harm. On a more legal perspective, Le Pautremat (2006) and Reifegerste (2002) focus on the French case, which presents the specificity of rejecting the mitigation principle in tort as well as in contract law. They both plead in favor of incorporating a duty to mitigate in French contract and tort law.

To the extent that we focus on the social costs of accidents, our paper is also related to the abundant literature dedicated to the optimal liability regime initiated by Brown (1973) and Shavell (1980). As explained by Shavell (1980) and Shavell (1987), strict liability creates optimal incentives when the injurer alone can invest in precautions, as he then internalizes all the costs and benefits of precautionary measures. By contrast, when both parties can invest *ex ante* in care, a negligence regime

[3] A precise definition of this duty has been proposed in Darbishire v. Warren, England and Wales Court of Appeal, July 30, 1963: *"It is important to appreciate the true nature of the so-called "duty to mitigate the loss" or duty to minimize the damage. The plaintiff is not under any actual obligation to adopt the cheaper method; if he wishes to adopt the more expensive method, he is at the liberty to do so and by doing so he commits no wrong against the defendant or anyone else. The true meaning is that the plaintiff is not entitled to charge the defendant by way of damages with any greater sum that that which he reasonably needs to expend for the purpose of making good the loss. In short, he is fully entitled to be as extravagant as he pleases but not at the expense of the defendant."* In spite of this inaccuracy, the term is universally used.

[4] Another related issue, which we do not consider in this paper, is the possibility for the victim to increase her own damage by adopting a strategic behavior, as studied by Friehe & Tabbach (2021).

[5] Other examples include Wittman (1981), Levmore (2009) and Hillman (1976), who all focus on mitigation following a contractual breach.

leads to efficient incentives, as shown by Cooter & Ulen (1986). Closer to our concern, Shavell (1983) offers a general model of torts in which parties act sequentially and both contribute to the occurence of the damage. Shavell (1983) argues that in such a framework, optimal behavior will be induced by any liability rule which leads the second party to take care only if the first party took care, as for instance under a rule of defense of contributory negligence when the victim acts first. Shavell (1983) however does not consider the possibility that the victim acts after the occurence of the damage to reduce its magnitude. Similarly, Pelled (2019) studies the issue of efficient incentives in tort, by forging the concept of *"proportional internalization"*. Pelled (2019) argues that if parties internalize an equal share of the costs and the benefits of their actions, they will have efficient incentives to invest in the optimal level of care. Proportional internalization as defined by Pelled (2019) is however not specific to situations in which the parties act sequentially. In line with this literature, we investigate the optimal liability regime in case of an accident, but we focus on *ex post* mitigation by the victim.

From an economic standpoint and a social welfare maximizing perspective, if we consider in line with Calabresi (1970), that the main function of tort law is to reduce the social cost of accidents, there is no reason why mitigation should be constrained to contract law. It seems sensible that the victim who could adopt a loss-minimizing behavior at a reasonable cost should do so. Mitigation is quite close to the least-cost avoider principle, according to which liability should be placed on the party who could have avoided the accident at the lowest cost.[6] In both cases, the idea is that law should provide incentives to adopt a social-cost minimizing behavior -whether before of after the accident has occurred. Regarding the least-cost avoider principle, Garoupa & Dari-Mattiacci (2007) argue that *'this approach is unanimously recognized as desirable, because not only does it induce parties to prevent accidents but it also forestalls wasteful care-taking by the party with the highest costs of care or, even worse, care-taking by both parties'.*

Several reasons could however explain the reluctance to impose a duty to mitigate in tort, while it is more widely accepted in contract law. First, implementing a mitigation rule is easier in contract law, since parties often have outside options on the market. Mitigation then simply consists in contracting with a third party. Goetz & Scott (1983) argue that under some circumstances, the optimal mitigating principle would require each party to take whatever efforts are necessary to minimize the joint costs of renegotiating the contract. In tort, the situation is more tricky : defining the optimal mitigation is not obvious, as explained by Fenn (1981).[7] Moreover, the mitigation costs need to be verifiable, or else mitigation could distort the parties' incentives. If courts underestimate mitigations costs, the victim might have incentive to under-invest in reducing the damage. Conversely, overestimation of mitigation costs could lead to over-optimal spendings in mitigation. Hence, the degree to which mitigation costs are verifiable is a central issue, as discussed for instance by Levmore (2009).

Second, a more general efficiency argument against mitigation in tort is the risk of under-precaution.[8]

Indeed, the injurer could anticipate that he would only have to compensate for part of the harm and could then be less cautious[9]

In this paper, we assess whether such arguments against a mitigation rule in tort law are well founded.

[6] See Demsetz (1972).

[7] Fenn (1981) studies the simple example of a retailer whose provider is unable to honor the contract. According to the author, courts often wrongly consider that mitigation implies turning to another supplier, and that mitigation costs then results in the price difference for a similar product. However, if prices increase, optimal mitigation should also imply reducing quantities, which courts often overlook.

[8] This argument is for instance developed by Dari-Mattiacci & Garoupa (2009) in the case of bilateral accidents and is also relevant regarding mitiagtion.

[9] Either the victim mitigates and only the residual harm is compensated for; or the victim does not mitigate and she loses part of her compensation.

Our aim is to build a general model of mitigation in tort law in order to define the conditions under which mitigation is welfare enhancing. While "the relatively simple structure of a tort problem provides one of the most fertile areas for the application of economic analysis to law" (Dari-Mattiacci & Parisi (2005)), no paper - to our knowledge - has investigated how the duty to mitigate could impact standard model of tort in this field up to now. To reach this goal, we study the effect of the duty to mitigate on accident avoidance and reduction in situations where injurers and victims act sequentially: the accident is unilateral (i.e. its occurence only depends on the injurer's behavior), but the magnitude of the damage can be reduced by the victim after the harm has occurred.

In this framework, we study successively a strict liability regime (the injurer is always liable for the harm caused, regardless of his level of care) and a negligence rule (according to which the injurer is liable only if he failed to take sufficient precaution). If the mitigation rule applies, we consider that the victim is compensated for the harm she was not able to reduce via reasonable measures, plus the cost of such harm-reducing efforts.[10] Under a mitigation principle, if the victim fails to take any harm-reducing measures, she is only compensated up to the level of harm that would have remained after such reasonable measures, had they been implemented, plus the cost of the said measures. Last, we also explore the impacts of the verifiability of the mitigation costs by courts. When the victim's costs are fully verifiable, we show that mitigation always leads to the optimal incentives, in a strict liability regime as well as under a negligence rule (section 5). The results are much more nuanced when mitigation costs are not fully verifiable (see section 6). Under a strict liability rule, the duty to mitigate acts as a reduction in the compensation the injurer has to pay because only the damage and the verifiable part of the mitigation costs will be reimbursed to the victim. The consequence is under-optimal incentives to invest in precaution, and some situations where the duty to mitigate is not welfare-enhancing compared to the absence of duty to mitigate. We come to similar results under a negligence rule and imperfectly verifiable costs: mitigation does not necessarily increase social welfare as it can lower too strongly the incentives of the injurer to prevent accidents. In conclusion, we argue in favor of a mitigation rule to reduce the social costs of accidents, with a warning on mitigation costs' verifiability that strongly impacts the efficiency of the duty to mitigate. This may explain why the duty to mitigate is less frequently observed in tort cases than in contrat law where verifiability of mitigation costs may be easier to establish.

We offer a closer look at the legal framework in Section 2. Our theoretical model is presented in Section 3. In section 4, we determine equilibria in the absence of a duty to mitigate. Sections 5 and 6 explore what happens when this duty is introduced, both with perfect and imperfect verifiability of mitigation costs. Section 7 interprets the impacts of the introduction of a duty to mitigate and section 8 concludes.

2 The Legal Framework

While the mitigation principle is often presented as a typical feature of contrat law in common law countries (section 2.1), most continental law countries have also adopted some type of duty to mitigate after a contractual breach (section 2.2). Several international treaties also include a mitigation principle (2.3). Implementing a mitigation rule raises several issues, which have progressively been clarified (section 2.4).

[10] Whether or not damages are correctly evaluated by courts, as discussed by Fenn (1981) is a close but separate issue, which needs to be sidestepped here.

2.1 The mitigation principle in common law

Although the mitigation rule is widespread in contract law in common law countries, its precise origin remains unknown. We do know that it is clearly linked to the obligation of replacement in the sale of goods (see Muir-Watt (2002)). This origin is reflected in various texts to this day. In the United Kingdom, the Sale of Goods Act of 1979 includes a mitigation principle in the paragraphs dedicated to damages for non-acceptance (article 50) and damages for non-delivery (article 51). In both cases, the act states that the amount of damages in case of contractual breach should be equal to *"difference between the contract price and the market or current price of the goods."*

Similarly, in the United-States, the Uniform Commercial Code includes a form of mitigation principle at article 2-706 (1). It provides that, in case a sales contract has not been executed, *"the seller may resell the goods concerned or the undelivered balance thereof. Where the resale is made in good faith and in a commercially reasonable manner the seller may recover the difference between the resale price and the contract price together with any incidental damages allowed under the provisions of this Article (Section 2-710), but less expenses saved in consequence of the buyer's breach".*

The duty to mitigate is not explicitly mentioned in either text, but the damages allocated when the sale is not carried-out correspond to the difference between the contract price and the market price. This method of defining damages *de facto* gives incentives to parties to find alternatives to the contract on the market. In this sense, both U.S. and English law recognize a mitigation principle in sales contract.

The mitigation rule is also mentioned explicitly by the Restatement (Second) of Contracts § 350 in a paragraph entitled *'Avoidability as a Limitation on Damages'*. The Restatement of Contracts states that *'(1) except as stated in Subsection (2), damages are not recoverable for loss that the injured party could have avoided without undue risk, burden or humiliation. (2) The injured party is not precluded from recovery by the rule stated in Subsection (1) to the extent that he has made reasonable but unsuccessful efforts to avoid loss'.*

2.2 Civil law countries

Most countries following a civil law system have also incorporated, to some degree, a form of mitigation principle. The German Bürgerliches Gesetzbuch (BGB) does mention the obligation to mitigate the damage in an article on contributory negligence. The rule seems to apply both in contract and in tort. The BGB does not make a clear distinction between the victim's fault in the occurence of the damage (*ex ante*) and the victim's lack of action to mitigate the damage *ex post*.[11] Similarly, the duty to mitigate is mentioned explicitly in the Italian civil Code in the article dedicated to the victim's contributory negligence in contract law.[12] As recalled in the introduction, contributory negligence and mitigation both focus on the victim's behavior. The two concepts are however different in the sense that the duty to mitigate arises *ex post*, once the damage has already occurred so as to decrease its amount.

[11] Article 254 of the Bürgerliches Gesetzbuch provides that *'(1) Where fault on the part of the injured person contributes to the occurrence of the damage, liability in damages as well as the extent of compensation to be paid depend on the circumstances, in particular to what extent the damage is caused mainly by one or the other party. (2) This also applies if the fault of the injured person is limited to failing to draw the attention of the obligor to the danger of unusually extensive damage, where the obligor neither was nor ought to have been aware of the danger, or to failing to avert or reduce the damage.'*

[12] Article 1227 or the Italian civil code is entitled *'Contributory negligence of the creditor'* and states that *'if the creditor's negligence has contributed to cause the damage, the compensation is reduced according to the seriousness of the negligence and the extent of the consequences arising from it. Compensation is not due for damages that the creditor could have avoided by using ordinary diligence'.*

Belgium law, which is strongly inspired by the French civil Code, has also integrated a form of mitigation principle. Encouraged by the doctrine, Belgian case law has largely contributed to the development of the obligation to minimize the damage. It has been written that *"once the harmful act has been committed, it is in line with the spirit of Belgian civil law that the injured party should act as a pater familias, in order to limit the damage as much as possible."*[13] The only textual ground in Belgium law for the mitigation rule is article 1134 of the Civil Code which imposes upon the contracting parties a general obligation of good faith. In a founding case of 1990, the Court of Liège considered that a creditor who fails to take reasonable steps to mitigate the harm caused by the debtor's misconduct breaches the duty of good faith and commits a breach of contract.[14] Since then, Belgian courts justify the duty to mitigate on the ground of good faith and abuse of right.[15]

A remarkable exception is French law, which consistently refuses to recognize a mitigation principle. Several scholars have repeatedly criticized this stance,[16] but French courts as well as the legislator so far remain inflexible. The constant refusal of the mitigation principle is consistent with more general trends in French tort law, such as the rule of full compensation (which admits very few exceptions) and the unconditional protection of the victim, which has been criticized by numerous scholars such as Chabas (2000). Imposing upon the victim a duty to mitigate is considered to be contrary to the fundamental principle of full compensation. As explained in Bondon (2020)'s recent work, the rise of this principle reveals a change in civil liability, which now gives priority to the compensatory function (as opposed to dissuading and punishing). The rule of full compensation is also consistent with the objectification of civil liability and contributes to the clear retreat of the notion of fault. [17]

2.3 International law

The duty to mitigate is also a common rule in international law. The United Nations Convention on Contracts for the International Sale of Goods (known as the Vienna convention) includes a mitigation principle. Article 77 of the Vienna convention provides that: *'A party who relies on a breach of contract must take such measures as are reasonable in the circumstances to mitigate the loss, including loss of profit, resulting from the breach. If he fails to take such measures, the party in breach may claim a reduction in the damages in the amount by which the loss should have been mitigated.'* Similarly, in the Draft Common Frame of Reference (DCFR)[18], the mitigation principle is found in Article III 3: 705. The DCFR states that *'the debtor is not liable for loss suffered by the creditor to the extent that the creditor could have reduced the loss by taking reasonable steps. (2) The creditor is entitled to recover any expenses reasonably incurred in attempting to reduce the loss.'*

[13] Pirson & de Villé (1935).
[14] Liège, 25 mai 1990.
[15] See for instance Cass. 14 May 1992 or more recently Cass. 17 May 2001.
[16] See for a thorough review of the topic Reifegerste (2002) and Mekki (2013).
[17] Although the constant refusal of the French Supreme Court to recognize a duty to mitigate has been often criticized, the only exception in French law pertains to insurance law. Article L.172-23 of the Insurance Code provides that *"the insured must contribute to the rescue of the insured objects and take all measures to protect his rights against the third parties responsible. He shall be liable to the insurer for the damage caused by the non-fulfillment of this obligation resulting from his fault or negligence."* For an example of application of this texte, see the decision 07-19.447 issued by the Chambre Commerciale of the Cour de cassation on 10 march 2009. The Cour de Cassation considers that the insurer fails to prove that victim was aware of the damage and therefore concludes that the latter could not have a duty to mitigate. Thus the French supreme court clearly the Court has shown its will to make the constrain the scope of this text, and thus remains as faithful as possible to the principle of full compensation for damages.
[18] The DCFR which was first published in 2009 basically serves as a starting point for a future code of obligations in Europe. The DCFR contains principles, definitions and model rules, and its ultimate goal, as stated in the introduction, is to *"contribute to the harmonious and informal Europeanisation of private law"*.

2.4 Implementing the duty to mitigate

Once the idea of mitigation has been admitted (either by a legal provision or by case law), several issues remain to be solved. Case law has progressively specified some basic rules which are common to most legal regimes which implement a mitigation duty.

- First, it is widely admitted that the victim is entitled to obtain the reimbursement of the amounts spent on mitigation (although the Restatement of Contracts for instance does not explicitly mention this aspect). Wittman (1981) states that the victim *"can collect, however, for the avoidance costs that he should undertake"*. This remains true even if the victim did not succeed in mitigating the damage, as explained below.[19]

  The issue in this regards is that the victim's expanses might not be perfectly verifiable. Therefore, in the model presented in section 3 we consider that the victim's mitigation costs can be imperfectly verifiable. In case of bilateral accidents, it has been shown that the optimal levels of care can be obtained with any version of the negligence rule (standard negligence, strict liability with defense of contributory negligence, defense of negligence and comparative negligence), as long as costs are verifiable. However, Cooter & Ulen (1986) show that when the verifiability assumption is relaxed, comparative negligence is the most efficient regime. In line with previous work, we also show that when costs are not perfectly verifiable, the parties' incentives change drastically in the presence of a mitigation rule.

- Second, only *"reasonable measures"* should be taken by the victim under the mitigation principle. In other words, the victim is not entitled to obtain reimbursement of excessive expenses. While the rule seems sensible, the precise definition of reasonableness is not an easy task. For instance Goetz & Scott (1983) highlight that *"broad discretionary standards of behavior such as a general duty to use best efforts to mitigate, present acute enforcement difficulties in relational contexts"*. The victim is therefore facing a dilemma: not taking any measure (and not being entirely compensated) or taking measure which the court could consider to be *"unreasonable"*, in which case the cost of reducing the damage will stay at his charge. Courts generally consider reasonable measure to be what parties should do *"in the ordinary course of business"*.[20]

- Third, unsuccessful attempts at reducing the damage should also be taken into consideration to assess the amount of damages due to the victim. This latter provision is justified in the perspective of incentivizing parties to reduce the damage, since the threat of incurring unrecoverable costs would otherwise deter the victim from taking any measures which could be socially efficient.[21]

To sum up, the mitigation principle is widely accepted in contract law. It is not so much formally widespread in tort law (with the exception of Germany), but case law has extended its principle.[22] From a social welfare maximizing perspective, there is no solid argument justifying that the mitigation

[19] Case law in the United States regarding the damages in the event of wrongful discharge offers several examples of this principle. For instance, in the case Dickinson v. Talmage, 138 Mass. 249 (1885), it was held that following a wrongful discharge of an apprenticed employee, the measure of damages includes the reasonable expenses incurred by the father in obtaining new employment for his son after the breach. Several cases have rule in the same direction, as for example the Arkansas Supreme Court in Van Winkle v. Satterfield, 58 Ark. 617 (1894) as well as the Kansas Supreme Court in Rench v. Hayes Equipment Manufacturing Co., 134 Kan. 865, 8 P.2d 346 (1932).

[20] See Dunkirk Colliery Co. v. Lever (1878) 9 Ch. D. 20, 25.

[21] In the model below, we mainly tackle with the first difficulty (i.e. imperfect verifiability of mitigation costs).

[22] In English law, the founding case Darbishire v. Warren, England and Wales Court of Appeal, July 30, 1963 pertains to a car accident. The leading case in Canada regarding mitigation is Janiak v Ippolito [1985] 1 SCR 146, as mentioned above.

principle should be limited to contract law. In the next section, we build a general model of mitigation in tort law, in order to define, under strict liability and negligence, when the mitigation principle is efficient. We also discuss one of the core problem ensuing from the duty to mitigate, i.e. the difficulty to perfectly verify the level of mitigation costs supported by the injured party.

3 Theoretical framework

Let us first describe the notations and the timing of the game (section 3.1) and next define the optimal outcome, which will serve as a benchmark throughout the rest of the paper (section 3.2)

3.1 Notations and the timing of the game

We consider an injurer (he) and a victim (she) who are both risk neutral. The injurer can cause an accident which generates a certain level of harm for the victim. The injurer can take precaution to reduce the probability of occurence of the accident. We denote e the verifiable level of care chosen by the injurer ($e \geq 0$). This effort to reduce the probability of accident is costly for the injurer and is denoted $g_i(e)$. We assume that $g_i(0) = 0$, $g_i'(e) > 0$ and $g_i''(e) > 0$. An accident will then be caused by an injurer with probability $0 \leq p(e) \leq 1$, such that $p'(e) < 0$ and $p''(e) > 0$.

Let D be the magnitude of the harm caused to the victim in case the accident occurs. It can be verified *ex post*. Once the accident has occurred, the victim can make an effort y to reduce the magnitude of the harm. We then have $D(0) = \bar{D}$, $D'(y) < 0$ and $D''(y) > 0$. This effort is costly for the victim $g_v(0) = 0$, $\forall y > 0$ $g_v(y) > 0$, $g_v'(y) > 0$, and $g_v''(y) > 0$. We first consider that $g_v(.)$ is perfectly verifiable by the judge and then relax this assumption in section 6.

The two cases mentioned in the introduction offer examples of what mitigation costs can entail : they can pertain to the efforts to undergo surgery or to go through physical rehabilitation after an accident.[23] Outside the realm of physical treatments, mitigation can refer to the possibility of hiring a store manager after its owner has suffered from a car accident, in order to reduce the loss resulting from the closing of the store.[24]

Under the above mentioned assumptions, the timing of the game is as follows:

1. The injurer decides his level of care e (at cost $g_i(e) \geq 0$).
2. The accident occurs with probability $p(e)$. If the accident does occur, the victim chooses the effort y at cost $g_v(y) \geq 0$ that determines the magnitude of the harm
3. The victim obtains compensation according to the applicable legal rule.

In this framework parties act sequentially and can both have an impact on the damage: the injurer can reduce the probability of occurence of the accident by investing in care *ex ante*; while the victim can reduce the magnitude of the harm *ex post*. Contrary to the bilateral accident setting, the injured party does not have an impact *ex ante* on the damage (whether its probability of occurence or its amount). Formally, this implies that the victim bears the mitigation cost only if the accident has actually occurred, which differs from the standard bilateral accident setting. In this framework, we first define the optimal levels of care and efforts made respectively by the injurer and the victim.

[23] See on this issue Janiak v Ippolito [1985] 1 SCR 146.

[24] On this topic, the decision issued by the French Supreme Court on 19 June 2003 (Cour de Cassation, Chambre civile 2, du 19 juin 2003, 00-22.302).

3.2 The optimal levels of *ex ante* care by the injurer and of *ex post* effort by the victim

We determine here the levels of efforts e and y which minimize social costs. Let us denote e^* and y^* respectively the optimal level of *ex ante* care by the injurer and of *ex post* effort by the victim. C represents the total cost of accidents and includes the expected damage caused by the accident $p(e) \times D(y)$; the costs of *ex ante* precaution incurred by the injurer to reduce the probability of accidents $g_i(e)$; and the costs of *ex post* effort incurred by the victim to reduce the magnitude of the harm $g_v(y)$ in case of accident. Hence $C = p(e)[D(y) + g_v(y)] + g_i(e)$.
We solve:

$$\min_{\{e;y\}} \{p(e)[D(y) + g_v(y)] + g_i e)\} \tag{1}$$

This leads to:

$$\begin{cases} e^* = \text{argmin} & p(e)[D(y) + g_v(y)] + g_i(e) \\ y^* = \text{argmin} & D(y) + g_v(y) \end{cases}$$

The optimal levels of efforts e^* and y^* are:

$$\begin{cases} e^* \text{such that} & -p'(e^*)[D(y^*) + g_v(y^*)] = g_i'(e^*) \\ y^* \text{such that} & -D'(y*) = g_v'(y^*) \end{cases}$$

We assume the existence of interior solutions so that $e^* > 0$ and $y^* > 0$.[25]

The injurer optimally invests in e until the marginal benefit of his investment $(-p'(e^*)[D(y^*) + g_v(y^*)])$ equals its marginal cost $(g_i'(e^*))$. The marginal benefit of effort e is made up of the avoidance of the occurence of the damage $D(y^*)$ and the cost of the subsequent effort supported by the injured party $(g_v(y^*))$ in case of accident. Since the effort y is here made only if the accident occurs, a reduction in the probability that the accident occurs then reduces the probability that the effort y has to be made by the injured party.
The optimal level of investment by the victim (y^*) is such that the marginal benefit of this effort (i.e. the marginal reduction of the damage) is equal to the marginal cost of this effort.
When parties adopt the optimal level of care and effort, $C^* = p(e^*)[D(y^*) + g_v(y^*)] + g_i(e^*)$.

4 Equilibria in the absence of a duty to mitigate

When the victim has not a duty to mitigate the damage, the amount of compensation does not depend on the victim's behavior. The injurer compensates the damage amount to the victim. Two sub-cases can be distinguished here: the case of strict liability and the case of negligence. As traditional in the law and economics literature, under strict liability, the injurer is always held responsible for the harm his action has caused; by contrast, under limited liability, the injurer is only responsible if he did not invest at the optimal level of care.

We denote further (e_1^S, y_1^S) the efforts made by the parties under the strict liability rule; and (e_1^N, y_1^N) the levels of effort under the negligence rule.[26]

[25] The effort y is efficient up to its optimal level, i.e. $D(0) - D(y^*) > g_v(y^*)$ else $y^* = 0$.

[26] Throughout the paper, the subscript 1 will refer to the legal regime without a duty to mitigate, whereas the subscript 2 will describe a legal regime with a mitigation rule. The exponents S and N respectively refer to a strict liability regime and to a negligence rule.

4.1 The strict liability regime in the absence of a duty to mitigate

We first study the victim's behavior. In case of accident, she supports the damage and the potential cost to reduce it. However, she anticipates that she will also be compensated for the whole damage amount $D(y)$ under strict liability. As a consequence, she does not invest in harm reduction. Formally, she minimizes:

$$\min_y\{(D(y)+g_v(y)-D(y))\}$$

The first two terms of the equation $(D(y)+g_v(y))$ represent the costs supported by the victim because of the accident, and the third term $(-D(y))$ is the amount of compensation she gets at trial. This leads to $y_1^S=0$ and the value of the damage is $D(0)$, i.e. the highest damage amount because there is no mitigation by the injured party.[27]

By anticipation, the injurer minimizes:

$$\min_e\{p(e)(D(0))+g_i(e)\}$$

This leads to:

$$-p'(e_1)D(0)=g_i'(e_1)$$

In Appendix 1 (proof 1), we show that $e^*<e_1^S$ so that the equilibrium under strict liability and no duty to mitigate is (e_1^S,y_1^S) such that:

$$\begin{cases} e^*<e_1^S \\ y^*>y_1^S=0 \end{cases}$$

The victim does not invest in damage reduction because she is fully compensated for her damage. By anticipation, the injurer over-invests in precaution to avoid to pay a too high damage $(D(0))$ in case of accident. The expected total cost is: $C_1^S=p(e_1^S)D(0)+g_i(e_1^S)$, with $C_1^S>C^*$.

Proposition 1: A strict liability rule without a duty to mitigate does not lead to the socially optimal outcome: the injurer over-invests in care $(e_1^S>e^*)$ and the injured party under-invests in *ex-post* efforts to reduce the harm $(y_1^S<y^*)$. The social cost C_1^S is such as $C_1^S>C^*$.

4.2 The negligence rule without a duty to mitigate

Under a negligence rule, the injurer has to compensate the victim only if his level of care is below the optimal one $(e^N<e^*)$. Since there is no duty to mitigate, there is no requirement on the victim's behavior regarding effort y. We denote e_1^N and y_1^N the level of efforts in this situation. We first examine the incentives of the injured party to invest in harm reduction.

[27] The amount of compensation corresponds here to the damage supported by the victim. It does not include the mitigation costs because we explore the situation where there is no mitigation expected from the victim. However, if a judge nonetheless considered that the victim could be reimbursed for her mitigation if mitigation did occur, this would not change our qualitative results: the victim would minimize $\min_y\{(D(y)+g_v(y)-D(y))-\theta g_v(y)\}$ where $0\leq\theta\leq 1$ represents the degree of costs' verifiability (see section 6). This would still lead to $y_1^S=0$.

$$\begin{cases} y_1^N = \text{argmin} \quad D(y) + g_v(y) \text{ if e} \geq e^* \\ y_1^N = \text{argmin} \quad D(y) + g_v(y) - D(y) \text{ if e} < e^* \end{cases}$$

This leads to:

$$\begin{cases} y_1^N = y^* & \text{if e} \geq e^* \\ y_1^N = 0 & \text{if e} < e^* \end{cases}$$

When the injurer has optimally invested in precaution, the injured party does not receive any compensation. This gives her incentives to invest up to y^* in order to reduce the magnitude of the harm. However, when the injurer invests below the optimal level, he has to fully compensate the victim, who has then no incentive to reduce the harm.[28]

Regarding the incentives of the injurer to invest in precaution, we have:

$$\begin{cases} e_1^N = \text{argmin} \quad g_i(e) \text{ if } e \geq e^* \\ e_1^N = \text{argmin} \quad p(e)D(0) + g_i(e) \text{ if e} < e^* \end{cases}$$

This leads to:

$$\begin{cases} e_1^N = e^* & \text{if } e \geq e^* \\ e_1^N = e_1^S & \text{if e} < e^* \end{cases}$$

Since $e_1^N > e^*$, there is a contradiction in the second case. The minimizing-cost strategy of the injurer implies that he invest e^*. As a consequence, the victim chooses $y_1^N = y^*$.

Proposition 2: Under a negligence rule, without a duty to mitigate, the optimal levels of efforts are achieved ($e_1^N = e^*$ and $y_1^N = y^*$), which ultimately implies $C_1^N = C^*$.

The negligence rule allows to restore the optimal incentives for both parties, which ultimately minimizes the total social costs of accidents. This second proposition is consistent with the standard results in the Law and Economics literature according to which a negligence rule generates efficient incentives for both parties, whether in unilateral or bilateral accidents. In our framework however, the mechanism at stake is slightly different: although the victim has no obligation to minimize the damage, she has incentives to do so since she anticipates that, if the injurer took care at the optimal level ($e_1^N = e^*$), she will not be compensated. Therefore, whenever $e_1^N = e^*$, the victim will choose $y_1^N = y^*$: her interest is now to mitigate to avoid a too high damage that will not be fully compensated.

By contrast, under strict liability and no mitigation duty, parties do not have efficient incentives: the victim does not invest at all in *ex post* mitigation since she anticipates that she will be fully compensated. As a response, the injurer over-invests in *ex ante* precaution.

Table 1 summarizes the incentives of the parties to make efforts in the absence of a mitigation principle.

In order to determine whether implementing a mitigation rule is welfare enhancing, let us now study the strict liability and the negligence rules with a mitigation principle.

[28] Following footnote 26, results would remain similar if we consider that the compensation awarded to the victim would be $D(y) + \theta g_v(y)$ instead of only $D(y)$.

	Victim's effort y	Injurer's effort e	Social Cost
Strict Liability	$y_1^S = 0$	$e_1^S > e^*$	$C_1^S > C^*$
Negligence rule	$y_1^N = y^*$	$e_1^N = e^*$	$C_1^N = C^*$

Table 1: Incentives to make efforts in the absence of a duty to mitigate

5 Equilibria when the victim has a duty to mitigate under perfect mitigation costs' verifiability

In this section we consider a situation where the victim has a duty to mitigate. This duty implies that, if the injurer is held responsible, the victim will not be compensated for the damage that she could have avoided by taking *ex post* reasonable measures to reduce the harm. We first consider that $D(.)$ and $g_v(.)$ are fully verifiable by the judge. As a consequence, the **maximal** compensation that the victim can hope for is $D(y^*) + g_v(y^*)$: the judge will not award a compensation higher than the expected damage in case of mitigation and the mitigation costs to achieve it. As in section 4, we first study the case of strict liability and next the case of negligence.

5.1 Strict liability rule with a duty to mitigate

We denote further (e_2^S, y_2^S) the efforts made under the strict liability rule in the presence of a mitigation principle and perfect verifiability of mitigation costs.

In case of accident, the victim minimizes:

$$\{\min_y\{[D(y) + g_v(y) - D(y^*) - g_v(y^*)]\}\}$$

$$\Leftrightarrow \{\min_y\{D(y) + g_v(y)\}\}$$

This leads to $y_2^S = y^*$.

The victim has the optimal incentives to invest in mitigation because the amount of compensation works as a lump-sum transfer. To avoid a too high level of damage at her own charge, her interest is then to mitigate.

The injurer minimizes:

$$\min_e p(e)\{[D(y^*) + g_v(y^*)]\} + g_i(e)$$

The first-order condition becomes $-p'(e_2^S)[D(y^*) + g_v(y^*)] = g_i'(e_2)$.

Optimal incentives to invest are then restaured $e_2^S = e^*$.

The total costs generated in this situation are $C_2^S = p(e_2^S)[D(y^*) + g_v(y^*)] + g_i(e_2^S)$, i.e. $C_2^S = C^*$.

Proposition 3: Under strict liability and duty to mitigate, both the victim and the injurer have optimal incentives to invest (in accident precaution and damage reduction) when mitigation costs are perfectly verifiable.

Let us now compare the results obtained under strict liability with and without the duty to mitigate: in the absence of a duty to mitigate (section 4.1), the victim makes no effort to reduce the damage

because she anticipates that she will be fully compensated under strict liability. This generates incentives for the injurer to over-invest in preventing accidents. With the duty to mitigate, optimal incentives to invest are restored: the victim invests in damage reduction at the optimal level because her compensation is capped, and the injurer also invests at the optimal level because he anticipates he will have to pay $D(y^*) + g_v(y^*)$ in case of accident.

5.2 Negligence rule with a duty to mitigate

In this section, we explore what happens when the injurer is held responsible only if he did not invest at the optimal level of care, and if the injured party is compensated only up to $D(y^*) + g_v(y^*)$ if this optimal level of care has not been reached.
We denote e_2^N and y_2^N the level of efforts in this situation. We first investigate the victim's behaviour:

- If the injurer invests $e \geq e^*$, then the victim has to support the entire cost of the damage. The victim therefore minimizes $D(y) + g_v(y)$. This leads to $y = y^*$.
- If the injurer invests $e < e^*$, then the injurer has to compensate the victim for the harm caused up to $D(y^*) + g_v(y^*)$ because of the duty to mitigate. This gives the victim incentives to invest at the optimal level $y_2^N = y_2^S = y^*$, as described in the strict liability case.

To sum up, the victim always invests at the optimal level.

With negligence rule and anticipating the victim's behavior in case of accident, the injurer's program can be written:

$$\begin{cases} e_2^N = \text{argmin} \quad g_i(e) \text{ if } e \geq e^* \\ e_2^N = \text{argmin} \quad p(e)[D(y^*) + g_v(y^*)] + g_i(e) \text{ otherwise} \end{cases}$$

This leads to $e_2^N = e^*$.

Proposition 4: Under the negligence rule, the duty to mitigate leads to the optimal incentives to invest in care and damage reduction when mitigation costs are perfectly verifiable.

To sum up, introducing a duty to mitigate is always efficient when mitigation costs are perfectly verifiable: it restores efficient incentives under a strict liability rule (proposition 3) and it maintains efficient incentives under a negligence rule (proposition 4). We now explore what happens when mitigation costs are imperfectly verifiable.

6 Equilibria under imperfectly verifiable mitigation costs

Let us now consider that only a share $0 \leq \theta \leq 1$ of mitigation costs can be objectively verified by the judge. This assumption is consistent with previous work, such as Levmore (2009). The latter suggests that parties might prefer to avoid a court's assessment of their mitigation efforts and therefore explicitly stipulate damages in case of contractual breach. Since only the verifiable amount spent by the victim is included in the compensation allocated by the judge, the award the victim can get in court is $D(y^*) + \theta g_v(y^*)$.

The timing of the game remains unchanged. As previously, we first study the strict liability case ; and next turn to the negligence rule.

6.1 Strict liability with a duty to mitigate and imperfectly verifiable costs

The victim chooses y_3^S to minimize her cost $D(y) + g_v(y)$ taking into account the expected amount of compensation she will get $D(y^*) + \theta g_v(y^*)$

$$y_3^S = \arg\min_y \{D(y) + g_v(y) - D(y^*) - \theta g_v(y^*)\}$$

This leads to $y_3^S = \arg\min_y \{D(y) + g_v(y)\}$ so that $y_3^S = y^*$. Since the victim is not fully compensated and gets a fixed award, she makes effort to reduce her damage to avoid a too large loss at her own charge.

The injurer anticipates he will pay a compensation in case of accident, and that the award to pay includes only the verifiable part of the mitigation costs. Then he minimizes:

$$\min_e p(e)\{D(y^*) + \theta g_v(y^*)\} + g_i(e)$$

The first-order condition becomes $-p'(e_3^S)[D(y^*) + \theta g_v(y^*)] = g_i'(e_3^S)$. Since $0 \leq \theta \leq 1$, $e_3^S < e^*$.

To sum up, under strict liability with imperfectly verifiable mitigation costs, incentives are optimal for the injured party and sub-optimal for the injurer: $y_3^S = y^*$; $e_3^S < e^*$.

Proposition 5: Under strict liability, if mitigation costs are not perfectly verifiable, the duty to mitigate does not lead to optimal incentives for the injurer.

The injurer has lower incentives to invest in precaution (compared to the optimal level), because the amount of damages he anticipates to pay in case of litigation is lower compared to what he should pay at the optimum. This is due to the imperfectly verifiable mitigation costs, which are therefore only partly reimbursed to the victim.

The total costs generated in this situation are $C_3^S = p(e_3^S)[D(y_3^S) + g_v(y_3^S)] + g_i(e_3^S) = p(e_3^S)[D(y^*) + g_v(y^*)] + g_i(e_3^S)$ and $C_3^S > C^*$.

We can compare these results with equilibria under strict liability with duty to mitigate with fully verifiable mitigation costs $(y_2^S; e_2^S)$ and to the ones without duty to mitigate $(y_1^S; e_1^S)$.

- If we compare the equilibria $(y_3^S; e_3^S)$ to the ones under duty to mitigate but fully verifiable mitigation costs, the situation is less efficient. With fully verifiable mitigation costs, optimal incentives are obtained and total social costs are minimized (see Section 3). With imperfectly verifiable information, the injurer has no longer optimal incentives, so that higher total costs are observed: $C^* = C_2^S < C_3^S$.
- Under strict liability without duty to mitigate, the victim has under-optimal incentives to mitigate and the injurer has over-optimal incentives to do so $(y_1^S; e_1^S)$. When the duty to mitigate is introduced but mitigation costs are imperfectly verifiable, the duty to mitigate generates optimal incentives only for the victim. The injurer under-invests in precaution. When comparing C_1^S and C_3^S, the duty to mitigate with partial verifiable mitigation costs is more efficient $(C_3^S < C_1^S)$ than no duty to mitigate if :

$$p(e_3^S)(D(y^*) + g_v(y^*)) - p(e_1^S)D(0) < g_i(e_1^S) - g_i(e_3^S) \tag{2}$$

The right-hand side of this equation represents the benefit of having a duty to mitigate (compared to no duty to mitigate): the injurer saves on precaution costs as $e_1^S > e_3^S$, and $g(e_1^S) > g(e_3^S)$. The left-hand side of the equation represents the additional cost when there is a duty to mitigate (compared to no duty): accidents will be more frequent ($p(e_3^S) < p(e_1^S)$), generating damages and mitigation costs. The duty to mitigate is then preferable whenever equation (2) is true, i.e. having a duty to mitigate generates more benefits (savings on precaution costs) than costs (increase in expected costs of accidents).[29]

6.2 Negligence with a duty to mitigate and imperfectly verifiable costs

Under a negligence rule, the injured party is compensated only up to $D(y^*) + \theta g_v(y^*)$ if and only if the injurer has invested the optimal level of care.

- If the injurer invests $e \geq e^*$, then the victim has to support the entire cost of the damage. The victim therefore minimizes $D(y) + g_v(y)$. This leads to $y = y^*$.
- If the injurer invests $e < e^*$, then the injurer has to compensate the victim for the harm caused, but only up to $D(y^*) + \theta g_v(y^*)$ because of the duty to mitigate. This gives the victim incentives to invest up to optimal level $y_3^N = y_3^S = y^*$, as described in the strict liability case.

Under a negligence rule, the duty to mitigate gives the victim incentives to invest at the optimal level of mitigation, even if mitigation costs are not fully verifiable. The reason is that the victim anticipates that she will get a fixed award amount (like a lump sum transfer) and her interest is then to lower her total costs by mitigating.

Anticipating the victim's behavior in case of accident, the injurer's program can be written:

$$\begin{cases} e_3^N = \text{argmin} \quad g_i(e) \text{ if } e \geq e^* \\ e_3^N = \text{argmin} \quad p(e)[D(y^*) + \theta g_v(y^*)] + g_i(e) \text{ otherwise} \end{cases}$$

This leads to:

$$\begin{cases} e_3^N = e^* \text{ if } e \geq e^* \\ e_3^N = e_3^S < e^* \text{ otherwise} \end{cases}$$

The injurer will choose the least cost strategy. He prefers to invest $e_3^N < e^*$ if:
$p(e_3^N)[D(y^*) + \theta g_v(y^*)] + g_i(e_3^N) < g_i(e^*)$

$$\Leftrightarrow p(e_3^N)(D(y^*) + \theta g_v(y^*)) < g_i(e^*) - g_i(e_3^N) \tag{3}$$

Equation (3) means that the injurer does not always make the optimal efforts to avoid accidents. The right-hand side of equation (3) represents the benefit for the injurer to make effort e_3^N instead of e^*: he saves on *ex-ante* precaution costs. The left-hand side represents the cost of such a strategy: the injurer is likely to compensate the victim whenever an accident occurs (with probability $p(e_3^N)$). However, in this situation, the compensation to pay is "only" $D(y^*) + \theta g_v(y^*)$. Whenever Equation (3)

[29] Because $D(0) > D(y^*) + g_v(y^*)$, there are some situation where $p(e_3^S)(D(y^*) + g_v(y^*)) - p(e_1^S)D(0) < 0$. For instance, this can be the case when the impact of efforts s on the probability of accidents are weak, so that the difference between $p(e_1^S)$ and $p(e_3^S)$ is not too large. Because $g_i(e_1^S) - g_i(e_3^S) > 0$, this means that in these situations, the duty to mitigate is always more efficient than no duty to mitigate.

is true, the injurer chooses e_3^N instead of e^* because this corresponds to the least cost strategy for him. This situation is all the more likely to happen when $\theta \to 0$ as this decreases sharply the compensation to pay by the injurer in case of accident. We then define a threshold for the verifiability of mitigation costs:

- **Weak verifiability**: the situation where θ is low enough for equation (3) to be true.
- **Strong verifiability**: the situation where θ is high enough for equation (3) not to be true.

As a consequence, under weak verifiability of mitigation costs, the injurer under-invests in precaution when there is a duty to mitigate compared to a situation without any duty to mitigate.

Proposition 6: Under the negligence rule, the duty to mitigate leads to optimal incentives (for both the victim and the injurer) to invest only if there is a strong verifiability of mitigation costs. Otherwise, it leads to under-optimal incentives to prevent accidents for the injurer.

When comparing these results to the situation where negligence rule is applied but without a duty to mitigate, or with duty to mitigate with perfect cost verifiability, we can observe that the duty to mitigate may be welfare-decreasing. In the two previous case (no duty to mitigate or duty to mitigate with perfect cost verifiability), optimal incentives were achieved under negligence rule. Because the imperfect cost verifiability acts as a "reduction" in the compensation the injurer has to pay, this may lead to lower incentives to invest for him and the total social costs are higher.

Table 2 summarizes the parties' incentives to make efforts when mitigation costs are not perfectly verifiable (whether under strict liability or negligence rule). Only a negligence rule with strong cost verifiability leads to optimal incentives to invest for the two parties.

	Victim's effort y	Injurer's effort e
Strict liability	$y_3^S = y^*$	$e_3^S < e^*$
Negligence rule and weak verifiability of mitigation costs	$y_3^N = y^*$	$e_3^N < e^*$
Negligence rule and strong verifiability of mitigation costs	$y_3^N = y^*$	$e_3^N = e^*$

Table 2: Incentives to make efforts with a duty to mitigate and imperfect cost verifiability

7 Summary and concluding remarks

This paper offers a general model of the mitigation rule in tort law where the injurer can make an ex-ante costly effort to reduce the probability of accident and the victim can spend some ex-post costs to reduce the scope of the damage. A duty to mitigate implies that the victim has to mitigate and will be compensated up to the amount of damage that would be observed in case of mitigation, plus the cost supported for this mitigation. We study the impact of the mitigation rule on the parties' behavior, and ultimately on the social cost of accident, under two legal regimes: a strict liability rule on one hand; and a negligence rule on the other hand. We first show that when mitigation costs are perfectly verifiable (and therefore completely compensated for), introducing a duty to mitigate is always efficient: it restores efficient incentives under a strict liability rule (proposition 3) and it maintains efficient incentives under a negligence rule (proposition 4).

However, under the more realistic assumption that the victim's mitigation costs are not perfectly verifiable, the latter results do not hold. The reason is that imperfect verifiability acts as a reduction

of compensation when there is a duty to mitigate: the compensation is lower as only the verifiable part of the mitigation costs are compensated to the victim (in addition to the amount of damage). This has strong consequences. First, under a strict liability regime, the duty to mitigate only leads to optimal incentives for the victim but not for the injurer (proposition 5). When comparing this situation to the case where there is no duty to mitigate, the welfare is not always increased. The total social costs may be higher (compared to a situation without duty to mitigate) because of the decrease in the injurer's incentives to prevent the accident. Even if the injurer has over-incentives to prevent the accident when there is no duty to mitigate, this may be socially more efficient whenever these additional costs of precaution are lower than the increase in the expected damage caused by the under-investment in precaution observed when there is a duty to mitigate (but imperfect cost verifiability).

Second, under a negligence rule and imperfectly verifiable mitigation costs, the injurer may prefer to under-invest in precaution and to pay a reduced compensation (because of imperfect cost verifiability) than to make the optimal efforts of precaution. In comparison, the situation without duty to mitigate is then more efficient as it leads to the optimal efforts in precaution and mitigation.

Our results then shed a new light on the duty to mitigate in tort law. They underline the fundamental role of the verifiability of mitigation costs. Whenever this verifiability is weak, the introduction of a duty to mitigate does not necessarily increase the total welfare compared to a situation without any duty to mitigate. The reason is that a weak cost verifiability acts as a reduction in the compensation to pay to the victim and decreases the incentives of the injurer to invest in precaution.

Our findings may help to understand why the duty to mitigate is not generalized in tort law, while it is much more frequent in contract law. The implementation and verifiability of mitigation costs may be more easy in contract law, as mitigation often consists in finding an outside option on the market: the landlord whose tenants terminated the contract can search fo another tenant;[30] In contrast, mitigation may be both more complex to implement and to evaluate for tort cases, as illustrated by the two examples mentioned in the introduction, namely the decision to undergo a surgery or entrusting a third party to exploit a business.

Our paper is a first step to understand the impact of the duty to mitigate in tort law. While we explore here the problem of imperfect cost verifiability, other problems may be raised by the duty to mitigate as the uncertainty to reach mitigation in case of efforts or the asymmetric information about mitigation's efforts. All this calls for further investigation.

[30] See for instance Miceli et al. (2009) the seller whose buyer cancelled the deal can also find another buyer ...

Appendix 1 : proof

Proof 1. Comparison between e^* and e_1.

we can rewrite equations defining e^* and e_1 as:

$$\begin{cases} e^* = \text{argmax} \quad D(y^*) + g_v(y^*) = \dfrac{g_i'(e^*)}{-p'(e^*)} \\ e_1 = \text{argmax} \quad D(0) = \dfrac{g_i'(e_1)}{-p'(e_1)} \end{cases}$$

We can note that $\dfrac{g_i'(e)}{-p'(e)} > 0$ and $\dfrac{\partial \left\{ \dfrac{g_i'(e)}{-p'(e)} \right\}}{\partial e} > 0$. Because there is an interior solution, then $D(0) > D(y^*) + g_v(y^*)$ and $e^* > e_1$.

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